

REPORT

Landfill Gas Management Plan

Middle Peninsula Landfill - SWP No. 572

Submitted to:

Middle Peninsula Landfill

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1.0 LANDFILL GAS MANAGEMENT PLAN

1.1 Introduction

This Landfill Gas Management Plan (LFGMP) was prepared on behalf of the County of Gloucester (owner) and Waste Management Disposal Services of Virginia, Inc. (operator, WM) to describe the landfill gas (LFG) management program for the Middle Peninsula Landfill and Recycling Facility (Middle Peninsula Landfill; Facility) located in Gloucester County, Virginia (see Figure 1). This LFGMP addresses the applicable requirements regarding the control of decomposition gases for the Middle Peninsula Landfill. The Facility operates under the Virginia Department of Environmental Quality (DEQ) Solid Waste Permit No. 572.

The purpose of the LFGMP is to:

- Provide a procedure for WM and Middle Peninsula Landfill personnel to perform gas monitoring to detect the presence of decomposition gases in structures and in the subsurface at the facility boundary;
- Provide the DEQ with a description of the equipment and procedures that will be used to perform gas monitoring; and
- Present a program for implementing control measures that maintain compliance with the Virginia Solid Waste Management Regulations [VSWMR; Title 9 Virginia Administrative Code (VAC) Agency 20, Chapter 81, Section 200 (9VAC20-81-200)].

The remainder of this LFGMP is organized as follows:

- Regulatory requirements are summarized in Section 1.1.1;
- Site conditions are described in Section 1.1.2;
- The perimeter monitoring network is described in Section 1.4;
- Gas monitoring procedures are described in Section 1.6;
- Evaluation and reporting of gas data are described in Section 1.9;
- Landfill gas controls are described in Section 3.5;
- The Landfill Gas Remediation Plan is presented in Section 3.0; and
- Odor management control is presented in Section 4.0.

1.1.1 Regulatory Requirements

There are several requirements for LFG management, which are found in 9VAC20-81-200. These requirements are summarized below.

- The minimum frequency of monitoring must be quarterly (every 90 days, plus or minus 30 days) per the requirements of 9VAC20-81-200.B.4.
- The owner/operator shall keep records of the monitoring results throughout the active life of the Facility and the post-closure care period. The monitoring records shall include:
 - measured methane concentration at each probe and structure;
 - date, time, barometric pressure, atmospheric temperature, weather conditions, and probe pressures;

- names of monitoring personnel and brief descriptions of equipment and procedures used;
 - a numbering system to correlate monitoring results to a corresponding probe location; and
 - monitoring and design records for any gas remediation or control system (9VAC20-81-200.E).
- If the results of monitoring indicate an apparent exceedance of the action level [*i.e.*, 25% of the lower explosive limit (LEL, 1.25% by volume) for methane in structures or 80% of the LEL (4% by volume) at the Facility boundary], then the operator shall respond as follows: (i) immediately take steps to protect public health and safety; (ii) within 5 working days of the detection, notify the DEQ in writing that the action levels have been exceeded, and indicate the planned response actions to mitigate the exceedance (9VAC20-81-200.C.1).
- If the monitoring results indicate an exceedance of the compliance level [*i.e.*, 25% of the LEL (1.25% by volume) in structures or the LEL (5% by volume) at the Facility boundary], the operator must provide oral notification within 24 hours (9VAC20-81-530.C.3) and written notification within 5 working days in addition to increasing monitoring frequency, as well as developing and implementing the Landfill Gas Remediation Plan within 60 days of the exceedance (9VAC20-81-200.C.2). An email will suffice for either/both the 24-hour (oral) and 5-working day (written) notification requirement as long as the email contains the information required by the regulation.

1.1.2 Site Layout

The Middle Peninsula Landfill is an active municipal solid waste landfill in Gloucester County, Virginia. The site is located on approximately 510 acres of property, of which approximately 230 acres are permitted for waste disposal. The Facility is located east of U.S. Route 17 and south of State Route 601. The layout of the site and locations of the compliance boundary monitoring probes are shown on Figures 2A and 2B.

As presented on Figures 2A and 2B, there are two separate disposal areas. The two disposal areas are separated by jurisdictional waters of the United States. Regional land use is largely agricultural and silvicultural in nature. Residentially developed properties are present to the west and north of the Facility, and the properties to the east and south are undeveloped woodland.

The plan for development of the Middle Peninsula Landfill involves:

- placing waste in the landfill to the design elevations provided in the design drawings, as amended;
- managing stormwater, leachate, and LFG from the Facility; and
- closing the landfill when the final grades have been achieved.

During the active life of the site and during post-closure, LFG monitoring will be performed as described in the following sections. If methane is detected in one or more compliance boundary monitoring probes during the course of routine monitoring, various response actions, as described in the following sections, will be implemented.

1.2 Gas Monitoring Standard

The landfill gas monitoring and control system at the Facility has been provided for the protection of public health, safety, and the environment. The system is intended to ensure that LFG generated at the Facility during the period of operation, closure, and post-closure care will not exceed the methane concentrations specified in

9VAC20-81-200.A.1 at the Facility boundary.

1.3 Landfill Gas Control

1.3.1 Peak Flow

The Facility has provided peak flow calculations through 2068 based on estimated waste acceptance rates. These calculations are included in the most recently updated *Gas Collection and Control System Design Plan*, included in Appendix D.

1.3.2 Gas Venting and Collection System(s)

The overall LFG control system at the Facility currently is comprised of both passive and active devices, components, and systems.

As the need arises in the future if LFG is detected in one or more compliance boundary probes at a concentration that requires remedial measures, additional controls will be added as needed to eliminate the LFG migration issue. Details for these additional controls will be provided to the DEQ in the form of as-built information reports following completion of construction activities and remedial actions taken pursuant to the Facility's Landfill Gas Remediation Plan.

A summary of the typical passive and active LFG control systems that may be used at this Facility is presented in the following sections. The type of system will depend on the site conditions, local geology, and level of receptor risk that are associated with the LFG control needs.

1.3.2.1 Typical Passive System

Passive gas control systems typically are comprised of one or more of the following types of passive controls and are designed to provide for the venting of LFG from the waste mass.

- Landfill cap vents with geonet venting layers.
- LFG vent/wells. These are normally drilled and constructed in the waste mass, typically to 80% of the known waste mass thickness. The top end serves to allow gas to vent, and may or may not be equipped with a device to promote gas flow such as a solar-powered auto ignition vent flare.
- LFG trenches. Normally constructed in the waste mass, typically along the outer perimeter where the waste mass is relatively shallow. Trenches are typically constructed with vent risers located at both ends and on 100-foot or closer riser spacing. The vent risers may or may not be equipped with a solar-powered auto ignition vent flares.
- Soil gas vents and trenches. Typically constructed outside of the waste mass and designed to intercept and vent migrating LFG. Depending on the gas concentrations, the vent risers may be equipped with solar-powered auto ignition vent flares.

1.3.2.2 Typical Active System

Active vacuum extraction systems will normally have a blower/flare station equipped with an electrically powered blower, moisture separator, and a flare sized for the design flow. The blower is operated in line with and connected

to one or more gas well vent or trench riser pipes via a header pipe. The header piping is normally sloped towards the flare station or a series of “J” traps to prevent accumulation of liquid condensate in the header line. The accumulated LFG condensate is collected at the blower flare station and managed as landfill leachate.

In addition to vacuum extraction systems, positive pressure systems can be used in certain cases where odor control is problematic or air emission restrictions are costs prohibitive. Positive pressure will be only used when adequate controls are in place to ensure that elevated gas concentrations are not likely to be forced off-site via known or unknown preferential flow pathways.

1.4 Perimeter Monitoring Network

Consistent with the VSWMR, the current boundary probe monitoring network is designed to monitor the perimeter of the Facility boundary for the presence of LFG that may be migrating in the vadose zone adjacent to the Facility. This network is comprised of 19 existing compliance boundary probe locations, 1 voluntary boundary probe location (GP-105), and 35 future compliance boundary probe locations. The locations of the boundary probes are shown on Figures 2A and 2B.

1.4.1 Description of Migration Potential

The mechanics of LFG movement have been summarized by the United States Environmental Protection Agency (USEPA) [1993] as presented below.

“Migration of landfill gas is caused by concentration gradients, pressure gradients, and density gradients. The direction in which landfill gas will migrate is controlled by the driving gradients and gas permeability of the porous material through which it is migrating. Generally, landfill gas will migrate through the path of least resistance.

Coarse, porous soils such as sand and gravel will allow greater lateral migration or transport of gases than finer-grained soils. Generally, resistance to landfill gas flow increases as moisture content increases and, therefore, an effective barrier to gas flow can be created under saturated conditions. Thus, readily drained soil conditions, such as sands and gravels above the water table may provide a preferred flow path, but unless finer-grained soils are fully saturated, landfill gases also can migrate in a ‘semi-saturated’ zone.”

1.4.1.1 Potential Pathways and Barriers

The Facility is located in the Virginia Coastal Plain physiographic province, which is characterized by an easterly dipping regression and transgression sequence of sedimentary units that generally thicken to the east. In general, these alternating units comprise a series of aquitards (silty and clayey units) and aquifers (sandy, silty, and gravelly units). Surface water runoff from the northern portion of the Facility drains to the west into tributaries of the Poropotank River, which discharges to the York River. Runoff from the southern portion of the Facility drains to the south into Woods Mill Swamp, a tributary of the Poropotank River.

The barriers to subsurface LFG migration at the Middle Peninsula Landfill are:

- The uppermost groundwater table beneath and in the vicinity of the site;
- The tributaries to Poropotank River located on the western edge of the site; and
- Woods Mill Swamp located on the southern boundary of the site.

WM maintains several buildings west and northwest of the landfill. These buildings include the maintenance building, the gas plant, pole barn, scalehouse, stone building, two deodorizer buildings, and a compressor building. Additionally, the Facility has 14 sump houses along the perimeter of the landfill.

1.4.2 Location

The locations of these gas probes are shown on Figures 2A & 2B.

1.4.3 Spacing

The spacing between gas probes is shown on Figures 2A & 2B. The spacing between the probes shall be reduced as necessary to protect persons and structures threatened by decomposition gas migration. Installation of additional probes may be required when on or offsite property development encroaches upon the Facility boundary and/or approved alternate boundary.

1.4.4 Depth

Depth to groundwater varies throughout the site, ranging from approximately 11 to 37 feet below ground surface. The elevation of the groundwater table will control the total depth of the boundary probes. Total depths of existing boundary probes and estimated locations for future boundary probes are included in Table 1 *Summary of Landfill Gas Probe Construction Details*.

Per the August 2017 updated DEQ guidance, future boundary probes will be constructed with multiple monitoring zones based on the depth to the uppermost water table. Specifications are as follows:

Probes that are less than 15 feet deep

- Top Zone screened 5 to 10 feet bgs

Probes that are less than 35 feet deep

- Top Zone screened 5 to 10 feet bgs
- Lower Zone screened 15 to water table or 30 feet bgs, whichever is encountered first

Probes that are greater than 35 feet deep

- Top Zone screened 5 to 10 feet bgs
- Middle Zone screened 15 to 30 feet bgs
- Lower Zone screened 35 to water table

1.4.5 Monitoring Probe Construction and Identification

The existing gas probes were drilled and constructed between October 4, 1995, and July 11, 2019, in general accordance with the DEQ Submission Instruction No. 13 (DEQ, 2017a). The perimeter probes were completed with locking protective stick-up casings set over the PVC casings and into square concrete pads. The probes are labeled and equipped with PVC end caps and a 1/4-inch diameter quick-connect shut-off valve fittings for monitoring. The locations of the existing and proposed perimeter gas probes are shown on Figures 2A and 2B and the design detail is presented in Figure 3.

Construction reports and boring logs for the installed perimeter probes are presented in Appendix A. Additionally, information on the construction depths, locations and elevations, and a monitoring schedule for these probes is presented in Table 3.

1.4.6 Probe Repair and Replacement

Routine maintenance of the probes will occur during each monitoring event (*i.e.*, repairs of protective casing, lock, minor weathering of the concrete pad); however, probes requiring extensive repair (*i.e.*, pad replacement, damaged protective casing) will be addressed within 90 days of discovery, or prior to the next scheduled monitoring event.

1.4.7 Probe Decommissioning

Gas probes that are extensively damaged will be replaced following approval of a 14-day notice to the DEQ. The replacement probe will ideally be installed within 15 to 20 feet of the probe being replaced, with a similar design and depth. Probe replacement is considered a permittee change per 9VAC20-81-600.F, Table 5.2. Replacements that do not meet the aforementioned criteria will be reviewed by the DEQ and approved through a minor permit modification. The probe being replaced will be decommissioned by over-drilling followed by extraction of the well casing or via in-place grouting. The decommissioned borehole will be backfilled using bentonite to eliminate the potential for groundwater impact.

1.5 Structures

Monitoring in the structures on site will be performed by measuring oxygen and methane as a percent of the LEL in ambient air sampled from at least three locations within the structure, including entryways and any potential migration pathways (*e.g.*, cracked slab, gaps in foundation). The monitoring data will be recorded on the attached form (see Appendix C) or another similar form.

Currently, the scale house, maintenance building, and gas plant are the only buildings on-site that are both enclosed and potentially occupied by people. There are other open-air buildings that the Facility monitors quarterly. These buildings include Sump Houses 1-14, a pole barn, stone building, Deodorizer Buildings 1-2, and Compressor Building 1. Confined spaces, such as manholes or other enclosed areas, will be monitored for the presence of combustible gas prior to allowing properly trained people to enter those confined spaces. If other structures or buildings are added, these new locations will be added to the LFG monitoring program.

1.6 Sampling and Analysis

1.6.1 Introduction

The procedures for performing gas monitoring at gas probes and within structures at the Middle Peninsula Landfill are described in this section. The *WM Landfill Gas Migration Monitoring Standard Operating Procedure* is presented in Appendix B. The remainder of this section is organized as follows:

- Health and safety procedures for persons performing the monitoring are described in Section 1.6.2;
- Monitoring parameters are described in Section 1.6.4;
- Response and reporting requirements are described in Section 1.9; and
- Recordkeeping for gas monitoring data is described in Section 1.10.

1.6.2 Health and Safety Procedures

Landfill decomposition gas is flammable and may contain toxic constituents such as vinyl chloride and hydrogen sulfide. Therefore, caution and common sense are required when performing LFG monitoring or when performing maintenance in or around the gas monitoring probes. The following practices will be observed when performing gas monitoring:

- Make sure that the gas monitoring instruments are properly operating and calibrated prior to use;
- Never smoke around the gas probes;
- Always approach the monitoring location from upwind and stand upwind when opening or monitoring the gas probes, and stand to the side rather than directly over the probes; and
- Never enter a confined space or basement where LFG might be present without following confined space entry procedures.

Personal protective equipment (e.g., respirators and protective clothing beyond standard Level D) is not required to be worn during monitoring of LFG; however, the precautions described above must be followed. Gas monitoring equipment must be kept in good working order and calibrated regularly to provide reliable information on LFG. If at all possible, monitoring personnel should not place themselves in positions where exposure to significant concentrations of LFG could occur. If such a situation becomes absolutely necessary, a plan of action involving supplied air should be developed by a qualified industrial hygienist.

In the event of a regulatory exceedance during monitoring, the monitoring personnel should notify the Facility operator as soon as possible. When appropriate and as determined by the Landfill Manager, health and safety precautions will then be taken in the event that monitored combustible gas levels are observed to be above the action and compliance levels that are discussed in Section 1.6.2 of this plan.

If instruments are used to perform gas analysis and pressure measurement that are different from the typical equipment shown on Table 2, then the equipment list should be revised accordingly.

The gas probes around the perimeter of the site and occupiable on-site structures will be monitored on a quarterly

basis. Boundary probe monitoring events will occur during varying weather conditions (*i.e.*, high/low barometric pressure, extended periods of high/low barometric pressure) due to the high variability of subsurface gas migration. A checklist of typical equipment required for boundary probe and structure monitoring is presented on Table 3. The equipment will be capable of measuring methane concentration and pressure (LANDTEC GEM 5000 or equivalent). The following data will be gathered:

- Time of day when monitoring.
- Static pressure in the permanent gas probes.
- Percent combustible gas or methane equivalent (minimum), with additional data collected for oxygen, carbon dioxide, and balance gas if the meter is equipped to monitor these gases.

Data will be recorded on a gas monitoring log similar to the form presented in Appendix C.

1.6.3 Preliminary Activities

Prior to collecting monitoring data, monitoring equipment will be checked to see that the devices are working properly. Before monitoring any of the gas probes, the equipment will be calibrated in accordance with the manufacturer's recommendations. Meter calibration activities will be documented, including meter make, model, and calibration gas standards (batch, expiration, concentration).

1.6.4 Gas Probe Monitoring

The gas probes and on-site structures shall be monitored for methane. The gas probes will also be monitored for probe pressure, ambient temperature, and barometric pressure. General weather conditions will also be recorded for each monitoring event.

The required monitoring will be performed by Facility staff or a qualified outside party under contract to WM. The portable equipment to be used will be designed for the detection of combustible gases or vapors. It will be calibrated to methane and indicate the percentage of LEL. The standard operating procedure for this type of monitoring is as follows:

- Complete the top portion of the *Landfill Gas Monitoring Log*.
- Calibrate the monitoring equipment in accordance with the manufacturer's instructions.
- Open the static pressure tube of the monitoring meter to the atmosphere, and zero the pressure sensor so that subsequent pressure measurements will be relative to current barometric pressure. Zero the pressure gauge on the meter.
- Connect the fittings on the ends of the static pressure tube and gas sampling tube to the fittings on the gas probe cap and immediately read and record the static pressure.
- Leak check the entire sample train. This is done by sealing the end of the monitoring hose and verifying that air does not leak into the sample train either through stoppage of the pump or by maintaining a complete seal. Air infiltration must not be allowed during probe purging and monitoring.
- Purge the probe casing (piping). The objective behind this procedure is to record the conditions of the gas around the probe and not gasses trapped in the probe casing. The procedure should ensure that

ambient/external air should not be allowed to enter the probe prior to or during gas sampling to avoid inaccurate readings.

- Read and record concentration of measured gases (methane, and, if necessary, carbon dioxide, and oxygen).
- If the methane reading is slowly increasing as the probe is pumped, the value at two probe volumes is recorded.
- The completed monitoring log is to be left with the landfill operator for inclusion in the operating record as required by the regulations.

Monitoring should not be limited to using detection equipment. Monitoring should include visual observations of site conditions including:

- Distressed vegetation, including signs of stunted growth, wilting, color changes, death during the growing season, and bare spots.
- Increased “rotten egg” odors around the landfill, indicating the presence of hydrogen sulfide, a common trace constituent found in LFG.
- Air bubbles permeating through standing water outside the limits of waste that may be from gas laterally migrating and finding its way to the surface.

Special attention should be given to the following possible site conditions:

- Development of surrounding areas, such as placing impermeable ground covers (e.g., paved parking areas, building slabs), can force landfill gas to remain underground and promote lateral migration. Additionally, off-site structures and utilities can provide enclosed areas in which LFG may collect and pose a safety hazard.
- Heavy irrigation or rainfall that saturates the soil may provide an impermeable barrier to LFG causing lateral migration.
- Excavation activities such as utility trenches may cause LFG to escape through the adjacent soils and into the excavation. The LFG may accumulate to explosive levels or displace oxygen within the excavation. Both possibilities compromise safety.
- Surface cracks or settlement can cause uncontrolled venting of LFG or air intrusion into the landfill that could reduce LFG quality (decrease methane concentration) or increase the potential for a landfill fire.
- Barometric pressure, wind, and temperature can affect the net pressure of LFG present. At a lower barometric pressure, more LFG will tend to escape through the cover or the surrounding surface.
- Snow or frozen ground cover, as with saturated soil, can reduce surface permeability and increase lateral migration of LFG.

The monitoring program will continue throughout the post-closure care period. Once the 30-year post closure care period is completed, WM may request that LFG monitoring and control cease based on a demonstration that there is no potential for LFG migration beyond the property boundary or into Facility structures in accordance with 9VAC20-81-200.A.2 and post-closure care guidance.

1.7 Monitoring Conditions

Consistent with the DEQ’s Submission Instruction No. 13, boundary probe monitoring should occur when the

potential for LFG migration is highest. Landfill gas tends to migrate along the path of least resistance and moves from high pressure and concentration areas to low pressure and concentration areas. Migration is also affected by the permeability of the compacted waste, landfill cover material, and surrounding soils, as well as the height of the groundwater table. Barometric pressure also influences LFG migration, and low or falling barometric pressure may allow methane to migrate out of the landfill and into surrounding areas. Additionally, saturated or frozen soils on the surface of a landfill tend to impede surface migration and therefore increase the likelihood of lateral migration below the surface. Subsurface migration of LFG is difficult to predict; therefore, a monitoring program should include events that occur during varying weather conditions, including during periods of falling barometer, prolonged low pressure, or prolonged steady barometric pressure events.

1.8 Monitoring Frequency

The minimum frequency of monitoring must be quarterly (every 90 days, plus or minus 30 days) per the requirements of 9VAC20-81-200.B.4. Monitoring of the Facility probes and structures should be conducted on the same day where possible. If the monitoring is conducted over multiple days, the monitoring report should reflect the atmospheric conditions for each day of monitoring.

In response to an action level or compliance level exceedance in a boundary probe, additional monitoring will be conducted on a weekly basis for the affected and adjoining boundary probes (one on each side) as well as any structures located within 500 feet of the impacted probe(s). Once compliance levels are maintained for four consecutive weeks, the Facility operator can revert to a monthly compliance monitoring schedule for the boundary probes. Once compliance levels are maintained for three consecutive months, the Facility operator will return to quarterly compliance monitoring.

The gas monitoring and control program must continue throughout the post-closure care period, or until the Facility operator receives written authorization to discontinue by the DEQ. Reduction of the current LFG probe monitoring network may be proposed after achieving three consecutive years of quarterly monitoring resulting with no exceedance of the action levels in the probe(s) proposed for removal. Authorization to cease gas monitoring and control will be dependent on a demonstration by the operator that there is no potential for gas migration beyond the property boundary or into Facility structures. Gas monitoring and control systems must be modified, during the post-closure maintenance period, to reflect changing on-site and adjacent land uses. Post-closure land use at the site must not interfere with the function of gas monitoring and control systems.

1.9 Response and Reporting Requirements

1.9.1 All Readings Below Action Level

After the monitoring data have been recorded, the data will be presented to the Facility manager for review. If the results indicate that there is no combustible gas present or that there are no exceedances of the action or compliance levels at the monitoring points, the data will be filed at the landfill. These data will be available for

review by the DEQ. If there are exceedances, the procedures described below will be followed.

1.9.2 Action Level Exceedance

If there is an exceedance (greater than 1.25% by volume) in the scale house or other occupied building, persons will be evacuated from the building immediately, consistent with the procedures described in the *Emergency Contingency Plan* for the Facility. The immediate response will depend on whether there is an immediate threat to human health. The Facility operator will also implement the procedures described in the Landfill Gas Remediation Plan (Section 3.0).

If the results of monitoring indicate an exceedance of the action levels [*i.e.*, 25% of the LEL for methane in structures (1.25% by volume) or 80% of the LEL (4% by volume) at the Facility boundary], then the operator shall respond as follows:

- immediately take steps to protect public health and safety.
- within 5 working days of the detection, notify the DEQ in writing that the action level has been exceeded, and inform them of the planned response actions to mitigate the exceedance.

1.9.3 Compliance Level Exceedance

The VSWMR have established the LEL for methane (5% by volume) as the maximum allowable limit for methane at boundary *probes*.

If the monitoring results indicate an exceedance of the compliance level [*i.e.*, 25% of the LEL in structures (1.25% by volume) or 100% of the LEL (5.0% by volume) at the Facility boundary], the operator must:

- immediately take steps to protect public health and safety.
- provide oral or email notification to the DEQ within 24 hours of detection.
- within 5 working days of the detection, notify the DEQ in writing that the compliance level has been exceeded, and indicate the planned response actions to mitigate the exceedance in addition to implementing the appropriate response outlined in the Landfill Gas Remediation Plan (Section 3.0) within 60 days of the exceedance.

1.9.4 Other Reporting Requirements

Other noncompliance or unusual conditions relating to LFG will also be reported in accordance with the aforementioned 24-hour oral and 5-working day written notification requirements. Unusual conditions include, but are not limited to, planned or unplanned shutdowns of the gas control systems for a 48-hour period or longer, conditions that may endanger public health or the environment, or when a system is not operating in a manner that maintains regulatory compliance.

1.10 Recordkeeping

Field records are the responsibility of the field monitoring personnel. Field records must be kept on organized, legible, and up-to-date forms. Data must be recorded electronically or with an indelible ballpoint pen. The

necessary field records must be kept on gas monitoring log forms, such as the form presented in Appendix C. At the end of each monitoring event, the completed forms should be copied and filed in the Facility's permanent gas monitoring file for the site. The forms should be archived by WM until the end of the post-closure care period for the site.

The monitoring personnel must record the following information on the forms:

- Types of equipment used;
- Calibration of field equipment;
- Name of personnel performing the calibration and gas monitoring;
- Weather conditions at the site the day of the gas monitoring, including approximate air temperature and barometric pressure;
- Any deviations from the gas monitoring procedures that are described in this monitoring plan;
- Field observations directly relevant to the gas monitoring; and
- The date, time, and gas monitoring results for each probe and structure.

Note that the format of the sample form provided in Appendix C may be modified by WM, provided that the information listed above is provided on the form. The individual entries for calibration and monitoring results are described in more detail in the Section 1.6.

2.0 LANDFILL GAS DEMONSTRATION

2.1 Types of Waste

The Facility is a Subtitle D MSW Landfill. The Facility began accepting waste in 1994 and operates under Permit No. 572, issued by the DEQ.

2.2 Barriers to Migration

Information regarding barriers to migration can be found in Section 1.4.1.1 of this LFGMP. In addition to natural barriers, an engineered gas collection and control system is operated as a negative pressure barrier at the Facility, consistent with requirements of the Facility's Title V operating permit (Appendix D).

2.3 Landfill Gas Demonstration

WM will provide a plan to assess future LFG generation and migration at the landfill if methane concentrations become an issue at the Facility boundary in the future.

2.4 Alternate Gas Source Demonstrations

WM will provide an Alternate Gas Source Demonstration to the DEQ if and when the Facility operator discovers methane concentrations above compliance limits at one or more boundary probes or Facility structures and it is believed that the Facility is not the methane source.

3.0 LANDFILL GAS REMEDIATION PLAN

3.1 Introduction

The VSWMR require that solid waste disposal facilities have a LFG venting system or a gas monitoring program to control decomposition gases that result from biodegradation of organic wastes (9VAC20-81-200.B.1). VSWMR 9VAC20-81-200.A.1 requires that this system be designed so that the concentration of methane gas generated by the waste management unit does not exceed 25% of the LEL for methane (1.25% by volume) in facility structures (excluding gas control or recovery system components), or 100% of the LEL for methane (5% by volume) at the Facility boundary.

This section has been prepared in accordance with VSWMR 9VAC20-81-200, DEQ Submission Instruction No. 13, and the DEQ Clarification of Landfill Gas Regulatory Requirements Guidance Document, which require owners or operators to develop a remediation plan when a facility is found to exceed the LFG compliance levels at one or more perimeter boundary probes or within a landfill structure. The Facility has not had any LFG compliance level exceedances and has developed the following Remediation Plan voluntarily. The Remediation Plan information included in Section 3.0 of this LFGMP should be considered a contingency and is subject to change over time if the Facility were to have future exceedance(s) of methane compliance levels.

In this section, response actions and possible remedial actions are described. These actions will be implemented in the event that a methane gas concentration is detected that exceeds action and/or compliance concentrations. The remainder of this section is organized as follows:

- Response actions for public health and safety are discussed in Section 3.2; and
- Response actions for DEQ notification and implementing a Remediation Plan to address LFG exceedances in monitored locations is described in Section 3.3.

3.2 Response Actions for Public Health and Safety

If an action level exceedance [80% of the LEL (4% by volume) for methane] is detected at the Facility boundary, monitoring personnel will notify the Facility operator as soon as possible and, pursuant to 9VAC20-81-200.C.1(a) of the VSWMR, take all immediate steps necessary to protect public health and safety.

If methane is detected above 25% of the LEL (1.25% by volume) and less than 100% of the LEL (5% by volume) in the scale house or other occupied structures at the Facility, all persons, other than those performing the monitoring, will be evacuated. Then, monitoring will be repeated following evacuation at the locations where the exceedance was detected. If an exceedance is still detected in a structure, pursuant to 9VAC20-81-200.C.1(a) of the VSWMR, WM will take all immediate steps necessary to protect public health and provide a safe working environment for personnel working on the site. These steps include actions to reduce the risk of explosion, such as opening windows and doors to ventilate the structure and, if appropriate, shutting off utilities (e.g., electricity) that serve the structure.

If methane concentrations exceed 100% of the LEL, all personnel will be evacuated and emergency response

personnel will be contacted to ventilate the structure.

3.3 DEQ Notification and Remediation Plan

3.3.1 Action Level Exceedance

Within 5 business days of detecting an action level exceedance, the DEQ will be notified in writing of the exceedance and any response actions taken by WM. Additional monitoring may be required to investigate and verify the source of observed methane exceedances. If WM can demonstrate to the DEQ that the Facility is not the source of observed gas, the DEQ will be notified of this finding and no remedial action will be implemented. Monitoring of the boundary probes will continue after the gas source is identified and the data will be evaluated as they become available and will be maintained in the Facility's operating record for reference as needed.

3.3.2 Compliance Level Exceedance

In the event of a compliance level exceedance, the DEQ will be notified within 24 hours (oral) followed by a written notification within 5 business days if not previously submitted as part of the 24-hour notification. An email will suffice for either/both the 24-hour (oral) and 5-working day (written) notification requirement as long as the email contains the information required by the regulation. If the waste in the Facility is found to be the source of the gas causing the compliance level exceedance, then, in accordance with the VSWMR, WM will revise this Remediation Plan as appropriate to address the site-specific exceedance conditions and implement the procedures in the Remediation Plan (as amended) to investigate and remediate the exceedance. If the Remediation Plan is modified, it will be resubmitted to the DEQ for incorporation into the solid waste permit.

3.4 Nature and Extent of Gas Migration

3.4.1 Affected Probes/Structures Monitoring

If WM discovers future methane compliance level exceedances at the Facility within particular probes or structures, the affected probe subset will be monitored at an increased frequency as described in this LFGMP. The affected probe subset should include the exceeding probe(s) and structure(s) and those probes/structures immediately adjacent, such that at least one probe on either side of each exceeding probe/structure is being monitored at the increased frequency as well as any structures located within 500 feet of the impacted probe(s).

3.4.2 Existing Operations Impacting Gas Migration

In response to a compliance level exceedance, WM will describe the Facility's current operation status and any known changes to Facility operations (such as changes to the LFG collection and control system, waste disposal, cover placement, or other activities), or changes to onsite or offsite land use, which may explain the increases in gas migration since the existing control measures were implemented.

3.5 Gas Control Measures

3.5.1 Gas Control Description

In the event of a compliance level methane exceedance, WM will provide a description of the proposed additional gas control measures to be implemented to address the compliance level exceedance. Consistent with the DEQ's Submission Instruction No. 13, it is beneficial to provide a phased approach to LFG control, so that additional LFG remediation plans are not necessary if the proposed remediation is unsuccessful. New gas control measures or proposed upgrades to the existing gas control system should be described in detail, including equipment capabilities and schematic diagrams of equipment and setup. All equipment and pipe installations should be completed in accordance with recognized and generally accepted good engineering practices.

Gas control measures to protect structures and public health and safety could include one or more of the following:

- Flexible membrane liners;
- Active gas collection systems;
- Passive gas venting systems designed to be upgraded to an active system;
- Alarms;
- Ignition source control;
- Utility collars installed within structures and outside in trenches; and/or,
- Ventilation.

Gas control measures to prevent the migration of LFG could include the following:

- Perimeter air injection systems;
- Cut-off trenches;
- Slurry walls; and/or,
- Ventilation trenches.

The overall LFG control system at the Facility currently is comprised of both passive and active devices, components, and systems.

3.5.2 Maintenance and Repair

If WM implements any of the above-mentioned gas control systems, this Remediation Plan will be amended to include descriptions of procedures that will ensure gas control measures are maintained and operated as designed, including preventative maintenance, inspection, and protocols for making repairs to damaged components.

Gas control systems repairs should be completed as soon as possible unless an alternate repair timeframe is requested and approved. Repairs should be completed in accordance with recognized and generally accepted good engineering practices.

In accordance with the DEQ's Submission Instruction No. 13, replacement of a perimeter gas monitoring probe, a

gas remediation well, or a gas vent that has been damaged or rendered inoperable, without change to location, design, or depth can be made after notification to the DEQ 14 days in advance of the well/probe replacement. In general, the replacement probe, well, or vent should be located within 15 to 20 feet of the probe, well, or vent being replaced, and the design and depth of the replacement should be similar to the unit being replaced.

3.5.3 Remediation Standard

If WM implements this Remediation Plan at the Facility, the construction and operation of the proposed control measures at the Facility will:

- Prevent methane accumulation in onsite structures.
- Reduce methane concentrations at the monitored Facility boundary to below compliance levels.
- Provide for the collection and treatment and/or disposal of decomposition gas condensate produced at the surface.

Landfill gas condensate at the Facility is collected within the leachate collection system on-site.

3.5.4 Coordination with Air Program

The Facility maintains a Title V Air Permit (Permit No. PRO-40920) to operate a municipal solid waste landfill with a landfill gas collection and control system and a landfill gas-to-energy recovery system pursuant to 9VAC 5-80-1 of the Virginia Regulations for the Control and Abatement of Air Pollution. The most recently approved permit is included in Appendix D.

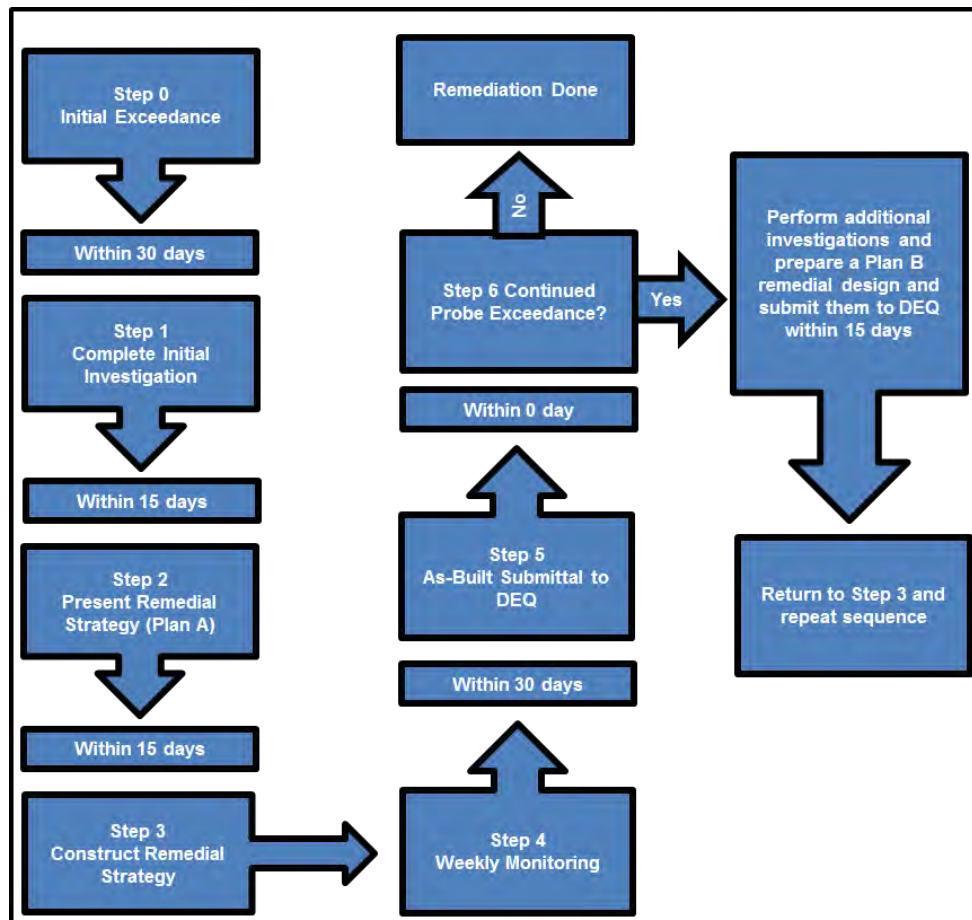
3.5.5 Implementation Schedule

In the event that an LEL exceedance for methane is detected in one or more boundary probes that cannot be mitigated with modifications to the existing Gas Collection and Control System, WM will initiate an Investigation Response. The Investigation Response is designed to identify the extent of the gas migration and to generate data that can be used to design and construct a remedial system for mitigation of the gas migration. Details for the Investigation Response are presented in the following steps:

A flow chart illustrating Steps 1 through 6 as required to obtain compliance is presented herein:

1. Within 30 days of noting the boundary probe LEL exceedance, complete additional investigations as needed to delineate the nature and extent of the landfill gas impacts and to develop a revised Remediation Plan.
2. Within 45 days of noting the boundary probe LEL exceedance, notify the DEQ of the investigative findings and present the conceptual remedial strategy with the proposed construction schedule in the revised Remediation Plan.
3. Within 60 days of noting the initial boundary probe LEL exceedance or 30 days of the continued exceedance under Step 5, commence with design and construction activities for the remedial strategy unless a longer construction schedule has been proposed to and approved by the DEQ.
4. Immediately upon completion of the remedial strategy construction activities, continue performing weekly monitoring to document the remedy progress.

5. Within 30 days of completing the remedial construction activities, submit construction as-built documentation for the constructed remedy to the DEQ. The as-built documentation will note the effectiveness of the remedy and will specify whether additional remedial actions are required at the time of submission to the DEQ.
6. If after 30 days of operation the remedial design from Step 3 does not eliminate the compliance issue, perform additional investigations as needed, complete additional designs as required to construct the next phase of the remedial approach, and present them to the DEQ within 45 days of initiating the previous Step 3 remedial operation. Return to Step 3 and repeat sequence as required.



3.6 Return to Compliance Monitoring Procedures

In order to return to the required minimum quarterly monitoring schedule, the Facility operator will need to continue to implement weekly monitoring, if required, of the affected probe/structure subset until consecutive weekly readings are below the action level for a month (*i.e.* four consecutive weeks of data showing methane concentrations below 4% methane). The Facility operator should then continue with monthly monitoring of the probe/structure subset until consecutive monthly readings are below the action level for a quarter (*i.e.* three consecutive months of data showing methane concentrations below 4% methane).

An alternate return to compliance gas monitoring frequency may be approved based on site specific conditions.

Consistent with the DEQ's Clarification of Landfill Gas Regulatory Requirements, proposed remedial actions and implementation schedules should attempt to resolve LFG exceedances within 18 months of the initial compliance level exceedance.

3.7 Response and Reporting

The Facility will follow the response and reporting requirements outlined in Section 1.9 of this LFGMP when performing increased frequency return to compliance monitoring.

If monitoring results show methane concentrations are below the action level, 24-hour oral notification and written notification within 5 working days is not required for that particular monitoring event. However, once the Facility operator has completed the required minimum number of consecutive monitoring events resulting in gas concentrations below action level to justify returning to a lesser monitoring frequency (*i.e.* monthly or quarterly), the Facility operator will submit monitoring data documenting the return to compliance to the DEQ.

4.0 ODOR MANAGEMENT PLAN

In accordance with 9VAC20-81-200.D, the Facility continues to monitor for potential landfill-related odors along the Facility property boundaries and beyond. The Facility's *Odor Management Plan*, revised in March 2020, provides details of the practices and technology used to minimize off-site odors and to address odor complaints as they occur, establishes responsibilities and procedures for collecting data pertinent to odor control, and defines methods for responding to odor generation and complaints. The *Odor Management Plan* is provided in Appendix E.

5.0 REFERENCES

USEPA. 1993. "*Solid Waste Disposal Facility Criteria Technical Manual*," Document No. EPA530 R 93 017, United States Environmental Protection Agency. November.

Virginia Department of Environmental Quality. 2017. *Submission Instruction #13 Landfill Gas Management, Remediation, and Odor Plans for Solid Waste Disposal Facilities*. August.

Virginia Department of Environmental Quality. 2017. *Land Protection and Revitalization Guidance Memo No. LPR-SW-2017-01, Clarification of Landfill Gas Regulatory Requirements*. September 5.

Virginia Division of Mineral Resources. 1993. *Geologic Map of Virginia*.

Virginia Waste Management Board. *Virginia Solid Waste Management Regulations (9VAC20-81 et seq.)*. As updated.

TABLE 1
SUMMARY OF LANDFILL GAS PROBE CONSTRUCTION DETAILS

Table 1
Summary of Landfill Gas Probe Construction Details
Middle Peninsula Landfill, Permit No. 572, Glenns, Virginia

Landfill Gas Probe	Probe Type	Northing	Easting	Approximate ground surface elevation (ft)	Top of Casing Elevation (ft)	Top of PVC Elevation (ft)	Depth of construction (below ground surface, ft)	Future Probe Corresponding Waste Cell	Monitoring Schedule
GP-101	Compliance	3718382.91	12026396.39	90.8	--	93.26	14	--	Quarterly
GP-102	Compliance	3717897.82	12026300.36	92.6	--	95.09	10	--	Quarterly
GP-103	Compliance	3717610.58	12026301.27	94.4	--	96.78	15	--	Quarterly
GP-104	Compliance	3717368.44	12026326.47	96.0	--	98.45	21.5	--	Quarterly
GP-105	Voluntary	3718170.45	12026899.78	96.7	--	99.17	15	--	Quarterly
GP-106	Compliance	3718151.00	12026304.81	93.5	--	--	12	--	Quarterly
GP-107	Compliance	3718585.42	12026510.84	96.41	--	--	15	--	Quarterly
GP-201	Compliance	3718646.18	12029910.62	104.26	--	107.33	23	--	Quarterly
GP-202	Compliance	3718719.78	12029420.65	111.02	--	113.45	29.5	--	Quarterly
GP-203	Compliance	371891.51	12028937.22	115.06	--	117.65	29.5	--	Quarterly
GP-204	Compliance	3719127.56	12028799.79	119.33	--	121.44	29.5	--	Quarterly
GP-205	Compliance	3718234.66	12030118.46	91.69	--	94.54	19	--	Quarterly
GP-206	Compliance	3717760.62	12030117.63	90.68	--	93.73	18.6	--	Quarterly
GP-301	Compliance	3717264.67	12030110.29	94.48	96.79	--	27	--	Quarterly
GP-302	Compliance	3716962.23	12026344.36	95.55	97.81	--	24	--	Quarterly
GP-303	Compliance	3716835.58	12030030.18	96.9	100.52	--	17.5		Quarterly
GP-401	Compliance	3716589.88	12026376.15	96.32	100.07	--	24	--	Quarterly
GP-402	Compliance	3716574.88	12029845.10	57.28	60.49	--	5.5	--	Quarterly
GP-601	Compliance	3716065.08	12026423.48	88.77	--	--	22	--	Quarterly
GP-602	Compliance	3716325.14	12029810.04	77.99	--	--	24	--	Quarterly
GP-603	Compliance	3716078.38	12029908.12	77.50	--	--	--	Cell 17	Quarterly
GP-801	Compliance	3715402.38	12027701.02	73.62	--	--	--	Cell 18	Quarterly
GP-802	Compliance	3715381.52	12027941.38	83.94	--	--	--	Cell 18	Quarterly
GP-803	Compliance	3715349.85	12028193.06	84.28	--	--	--	Cell 18	Quarterly
GP-804	Compliance	3715318.09	12028442.05	82.88	--	--	--	Cell 19	Quarterly
GP-805	Compliance	3715281.86	12028700.58	79.24	--	--	--	Cell 19	Quarterly
GP-806	Compliance	3715258.44	12028938.45	78.71	--	--	--	Cell 19	Quarterly
GP-807	Compliance	3715234.90	12029183.07	82.03	--	--	--	Cell 19	Quarterly
GP-808	Compliance	3715269.88	12029431.26	72.50	--	--	--	Cell 19	Quarterly
GP-809	Compliance	3715437.69	12029620.54	65.87	--	--	--	Cell 19	Quarterly
GP-810	Compliance	3715602.14	12029809.67	75.17	--	--	--	Cell 19	Quarterly
GP-811	Compliance	3715820.62	12029945.16	58.67	--	--	--	Cell 17	Quarterly
GP-901	Compliance	3719461.20	12028914.60	119.52	--	--	--	Cell 20	Quarterly
GP-902	Compliance	3719800.93	12029033.09	119.86	--	--	--	Cell 21	Quarterly
GP-903	Compliance	3720054.13	12029111.92	122.10	--	--	--	Cell 21	Quarterly
GP-904	Compliance	3720359.21	12029015.87	121.94	--	--	--	Cell 21	Quarterly
GP-905	Compliance	3720481.10	12028797.96	121.19	--	--	--	Cell 21	Quarterly
GP-906	Compliance	3720575.34	12028561.24	124.13	--	--	--	Cell 21	Quarterly
GP-907	Compliance	3720669.00	12028328.49	122.01	--	--	--	Cell 21	Quarterly
GP-908	Compliance	3720758.58	12028094.39	111.52	--	--	--	Cell 21	Quarterly
GP-909	Compliance	3720855.26	12027866.53	115.29	--	--	--	Cell 23	Quarterly
GP-910	Compliance	3720941.14	12027630.62	99.96	--	--	--	Cell 23	Quarterly
GP-911	Compliance	3721028.15	12027398.30	92.50	--	--	--	Cell 25	Quarterly
GP-912	Compliance	3720949.50	12027162.05	91.52	--	--	--	Cell 25	Quarterly
GP-1001	Compliance	3720947.53	12026904.23	87.98	--	--	--	Cell 25	Quarterly
GP-1002	Compliance	3720979.89	12026657.73	81.34	--	--	--	Cell 26	Quarterly
GP-1003	Compliance	3720864.39	12026432.97	81.15	--	--	--	Cell 26	Quarterly
GP-1004	Compliance	3718878.22	12026727.25	94.96	--	--	--	Cell 20	Quarterly
GP-1005	Compliance	3719163.71	12026597.45	94.56	--	--	--	Cell 22	Quarterly
GP-1006	Compliance	3719531.95	12026259.52	99.99	--	--	--	Cell 22	Quarterly
GP-1101	Compliance	3720905.65	12026184.72	68.90	--	--	--	Cell 26	Quarterly
GP-1102	Compliance	3720749.06	12025988.28	69.51	--	--	--	Cell 26	Quarterly
GP-1103	Compliance	3720498.01	12025916.12	77.62	--	--	--	Cell 26	Quarterly
GP-1104	Compliance	3720348.88	12025712.65	79.70	--	--	--	Cell 26	Quarterly
GP-1105	Compliance	3720052.88	12025668.98	92.40	--	--	--	Cell 26	Quarterly
GP-1106	Compliance	3719889.15	12025912.62	102.06	--	--	--	Cell 26	Quarterly

Notes: ft = feet

TABLE 2

LIST OF EQUIPMENT REQUIRED FOR LANDFILL GAS MANAGEMENT

TABLE 2

**LIST OF EQUIPMENT REQUIRED FOR LANDFILL GAS MANAGEMENT
LANDFILL GAS MANAGEMENT PLAN
MIDDLE PENINSULA LANDFILL, PERMIT NO. 572**

1	Gas Monitoring Log
2	Watch
3	Ball-point pens
4	Site map with probe locations
5	Gas pressure gauges and hose (if gas analyzer does not measure pressure)
6	Portable gas analyzer (such as GEM 5000 or equivalent)
7	Keys for locks on protective probe covers
8	Tool box with wrenches, pliers, assorted screw drivers, hammer, etc.

TABLE 3

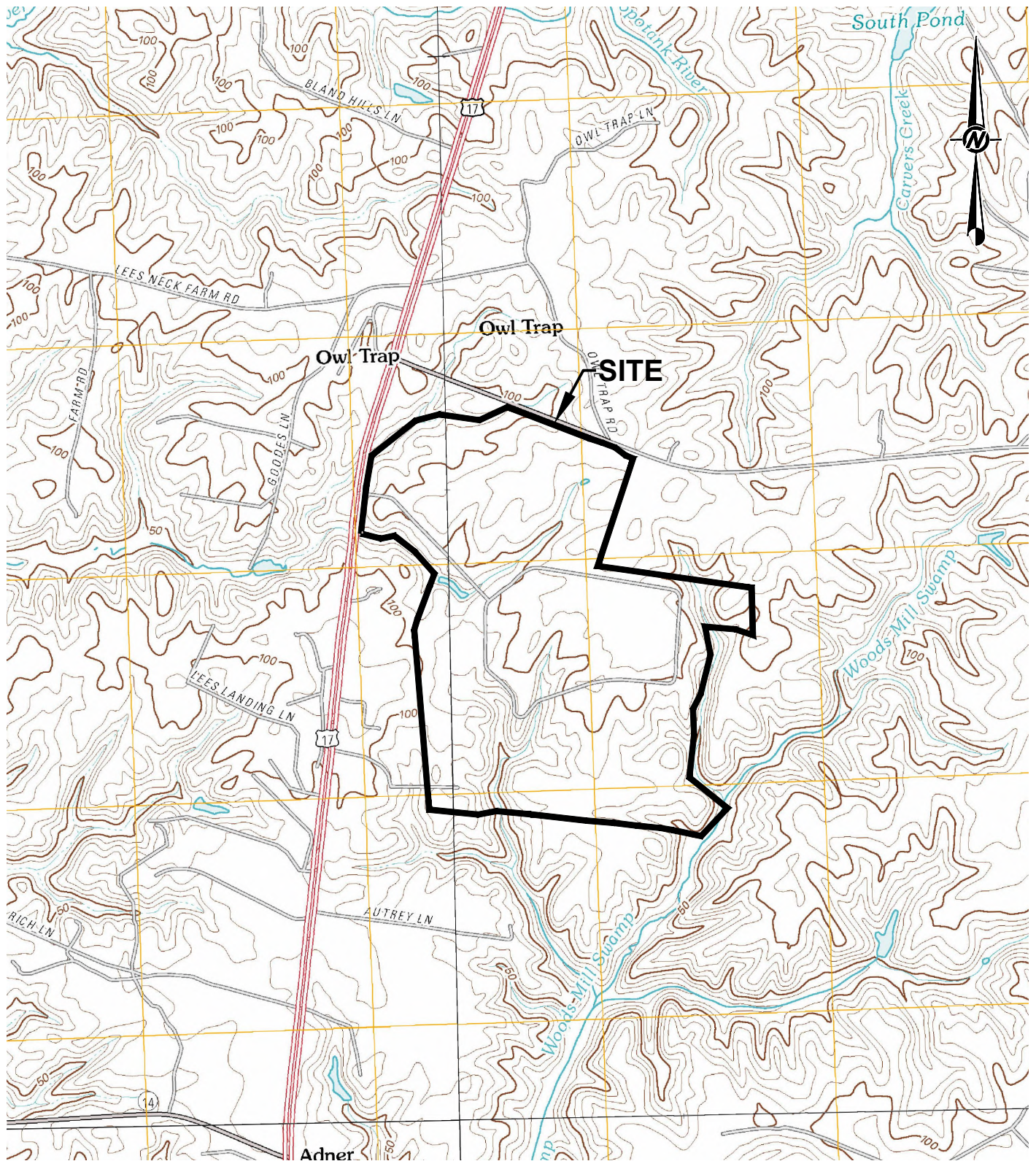
CHECKLIST OF LANDFILL GAS MANAGEMENT MONITORING PROCEDURES

TABLE 3

**CHECKLIST OF LANDFILL GAS MANAGEMENT MONITORING PROCEDURES
LANDFILL GAS MANAGEMENT PLAN
MIDDLE PENINSULA LANDFILL, PERMIT NO. 572**

PRIOR TO SAMPLING	
Calibrate the gas analyzer and record an initial ambient air reading. Record air temperature, barometric pressure, and general weather conditions at beginning and end of event.	
PROCEDURES TO BE REPEATED AT EACH LANDFILL GAS MONITORING PROBE	
1	Zero the gas analyzer pressure reading.
2	Connect the static pressure and gas sampling tubes from the gas analyzer to the fittings on the gas probe cap.
3	Read and record the shut-in pressure.
4	Turn on the sampling pump and, when the readings on the display stabilize, read and record the concentrations of methane, oxygen, carbon dioxide, and balance gas.
5	Disconnect the gas analyzer from the gas probe. Purge the gas analyzer with ambient air for a minimum of one minute.
6	Close and lock the protective casing over the gas probe.
PROCEDURES TO BE REPEATED AT EACH STRUCTURE	
1	Enter the normally occupied area of the structure.
2	Turn on the sampling pump, and when the readings on the display stabilized, read and record the concentrations of methane, oxygen, carbon dioxide, and balance gas.
3	Repeat Step 2 at two additional locations within the structure.

FIGURE 1
SITE LOCATION MAP



REFERENCE

Base map consists USGS topographic quadrangles Saluda, Shacklefords, Gloucester, and Gressitt VA dated 2011.

CLIENT

WASTE MANAGEMENT DISPOSAL SERVICES OF VIRGINIA, INC.

PROJECT

MIDDLE PENINSULA LANDFILL AND RECYCLING FACILITY
GLOUCESTER COUNTY, VIRGINIA

CONSULTANT



YYYY-MM-DD 2020-03-09

DESIGNED MGT

PREPARED AYA

REVIEWED MLC

APPROVED MGW

TITLE

SITE LOCATION MAP

PROJECT NO.
2013717021

REV.
0

FIGURE








1

FIGURE 2A
SITE MONITORING PLAN (1 OF 2)

FIGURE 2B
SITE MONITORING PLAN (2 OF 2)



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 MW-03D	EXISTING GROUNDWATER MONITORING WELL
 GP-206	EXISTING LANDFILL GAS BOUNDARY PROBE
 MW-15D	FUTURE GROUNDWATER MONITORING WELL
 GP-902	FUTURE LANDFILL GAS BOUNDARY PROBE
 OUTFALL 005	EXISTING STORMWATER OUTFALL
 OUTFALL 012	FUTURE STORMWATER OUTFALL
 80 = — — —	GROUNDWATER SURFACE CONTOUR (FEET ABOVE MEAN SEAL LEVEL)

2. 1. EXISTING CONDITIONS COMPILED BY QUANTUM SPATIAL USING PHOTOGRAMMETRIC METHODS, FROM AERIAL PHOTOGRAPHY DATED DECEMBER 29, 2020.
2. 2. LIMITS OF EXISTING LANDFILL CAP TAKEN FROM AUTOCAD FILE TITLED, "MPLF CAP LIMITS.DWG," PROVIDED BY FLORA SURVEYING ASSOCIATES.
3. 3. PROPOSED CONTOURS SHOWN REPRESENT FINAL CONDITION OF THE FACILITY.
2. 4. GROUNDWATER CONTOURS SHOWN BASED ON WATER LEVEL MEASUREMENTS TAKEN ON JANUARY 11, 2021.

FIGURE 3
TYPICAL LANDFILL GAS MONITORING PROBE

ABOVE GROUND SURFACE ASSEMBLY

STEEL OR ALUMINUM PROTECTIVE CASING (TYPICAL 12" DIAMETER)

REMOVABLE LOCKING LID

6" (MAXIMUM)

PVC LABCOCK VALVE

POLYPROPYLENE QUICK COUPLING

2" SCH. 40 PVC PIPE WITH FLUSH-THREADED COUPLINGS

PEA GRAVEL (12")

1/4" WEEP HOLE

DRY BENTONITE PELLETS

TRAFFIC PROTECTION POST (TYPICALLY CONCRETE FILLED), IF NECESSARY

3' TYPICAL

3' TO 5'

4" (MINIMUM)

4'x4' CONCRETE PAD

NATIVE SOIL

RISER PIPE

CEMENT-BENTONITE GROUT

SEAL: BENTONITE CHIPS OR PELLETS

PEA GRAVEL

PERFORATIONS (SEE DETAIL A)

PROBE COMPLETION DEPTH

BOREHOLE TOTAL DEPTH

1' (APPROX.)

2' MINIMUM

8" MIN.

PVC CAP WITH 1/4" DIA. HOLE

HIGHEST SEASONAL GROUNDWATER LEVEL OR 8' BELOW BOTTOM ELEVATION OF NEARBY REFUSE, WHICHEVER IS HIGHER.

NOTE:

1. FOR VADOSE ZONES GREATER THAN 25', CONSIDER TARGETING PREFERENTIAL MIGRATION ZONES.

DETAIL "A"

3"

DRILL 3/16" DIA. HOLE

90°

TYPICAL LFG MONITORING PROBE

NO SCALE

1. FOR VADOSE ZONES GREATER THAN 25', CONSIDER TARGETING PREFERENTIAL MIGRATION ZONES.

HIGHEST SEASONAL
GROUNDWATER LEVEL
OR 8' BELOW BOTTOM
ELEVATION OF NEARBY
REFUSE, WHICHEVER IS
HIGHER.

TYPICAL LFG MONITORING PROBE
NO SCALE

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TYPICAL LFG MONITORING PROBE

Date:	Oct. 20
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P-9

FIGURE 3

APPENDIX A
EXISTING BOUNDARY PROBE CONSTRUCTION LOGS

October 31, 1995

Mr. Jim Loveland
Waste Management Disposal Services of Virginia
Middle Peninsula Landfill & Recycling Facility
Gloucester, Virginia

Re: Summary Report of Gas Probe Installation
Gas Probes GP-101 Through GP-105
Middle Peninsula Landfill & Recycling Facility, Gloucester, Virginia
DEQ Solid Waste Permit No. 576
Rust Environment & Infrastructure Project No. 33536.105

Dear Jim:

This report summarizes the installation of five gas monitoring probes at the Middle Peninsula Landfill & Recycling Facility (MPLRF) in Gloucester, Virginia. These probes are located and were installed in accordance with Solid Waste Permit No. 572. This work was completed following the approved scope of work presented in the Rust Environment & Infrastructure (Rust) proposal dated September 27, 1995.

The installation of the gas probes began and was completed on October 4, 1995.

GAS PROBE INSTALLATION

Five gas monitoring probes were installed west of the recently constructed Cell 2 and leachate/truck loading station. The wells are labeled GP-101 thru GP-105. Each gas monitoring probe was constructed in accordance with the specifications of the Gas Monitoring Plan presented in the Part B Permit, Application and Solid Waste Permit No. 572.



Soil Borings

Five soil borings were drilled to depths ranging from 10 to 22 feet (+82 feet mean sea level (ft msl) to +76 ft msl). The borings were drilled with a CME 45 all-terrain vehicle mounted drill rig using 8.5-inch diameter (O.D.) and 4.25-inch inside diameter (I.D.) hollow-stem augers. Samples of the soil encountered were collected at 5-foot intervals beginning at ground surface. Sampling was accomplished by driving a 2-inch diameter split barrel sampler into the soil with a 140-pound hammer, free falling 30 inches using standard penetration test (SPT) procedures. The SPT borings were completed in general accordance with guidelines established in ASTM D-1586. Each boring was logged in the field by a E&I engineer according to The Unified Soil Classification System. The boring logs include a description of each split-spoon sample, the blow counts (SPT "N" Value), and other identification data regarding borehole designation, location, and drilling conditions. The boring logs are presented in Appendix A.

The surface geology at MPLRF consists of the Bacons Castle Formation of the Columbia Group, which is underlain by the Yorktown Formation. Soil borings were advanced into the non-saturated portion of the Bacons Castle formation. Soils encountered were consistent with previous borings and consisted of intermittent clay layers with predominately silts and sands. Colors ranged from dark olive gray to light brown.

Probe Construction

Each gas monitoring probe was constructed of 1-inch diameter schedule 40 PVC pipe within the approximate 8.5-inch diameter borehole. A 1-inch PVC cap was placed on both ends of the pipe to prevent material from entering the pipe. The screen lengths range from 5 to 10 feet and consist of 3/16-inch drilled holes offset 2-inches. A minimum of 6-inches of pea gravel was placed at the bottom each well. A filter pack consisting of pea gravel was placed around the screen, and extended several inches above the top of the screen.

A seal consisting of 2 feet of bentonite pellets was placed above the filter pack in each well and hydrated in place with water. The remainder of the borehole was grouted with quikcrete to ground surface. A 2.5 foot PVC stick up was retained as the surface completion for each well. A 6 x 6-inch protective aluminum casing was placed in the borehole to maintain 3 feet of aluminum casing above ground. A 12-inch diameter concrete cylinder pad was then constructed around the protective casing to stabilize the casing and deflect rain away from the wells. Each well was equipped with a locking cap.

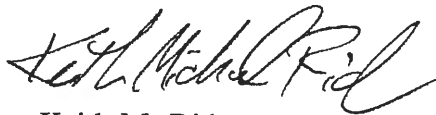
The only significant difference between the method of construction was with monitoring well GP-104. Because of the depth of 21.5 feet, the filter pack of well GP-104 was filled to 11 feet and

Mr. Jim Loveland
October 31, 1995
Page 3

6 feet of clean backfill soil was added above the filter pack. A 2 foot bentonite seal was placed above the backfill and 3 feet of quickcrete was placed above the seal. The well construction logs are presented in Appendix B. A summary of the well construction data is presented in Table 1.

We trust this report meets your needs. Please call us at (804) 266-0332 if you have any questions.

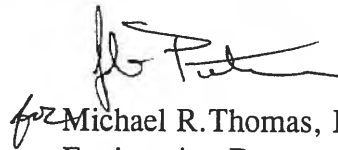
Sincerely,



Keith M. Rider
Staff Engineer

KMR/MRT/pwn

Attachments



for Michael R. Thomas, P.E.
Engineering Department Manager

TABLES

Table 1

**Gas Monitoring Well Completion Data
Middle Peninsula Landfill & Recycling Facility
Environment & Infrastructure Job No. 33536.105**

op of minum asing (SL)	Top of PVC Pipe (MSL)	Depths (feet below ground surface)				Well Materials	
		Well Depth	Screen Interval	Filter Pack	Seal Interval (Bentonite)	Diameter (inches)	Type
3.79	93.26	14.0	5 to 14	5.0 to 15.0	3.0 to 5.0	1	Manually Perforated Schedule 40 PVC
5.59	95.09	10.0	4.5 to 9.5	4.5 to 9.5	2.5 to 4.5	1	Manually Perforated Schedule 40 PVC
7.31	96.78	15.0	5.0 to 14.0	5.0 to 15.0	3.0 to 5.0	1	Manually Perforated Schedule 40 PVC
1.98	98.45	21.5	11.0 to 21.0	11.0 to 21.5	3.0 to 5.0	1	Manually Perforated Schedule 40 PVC
1.65	99.17	15.0	5.0 to 14.0	5.0 to 15.0	3.0 to 5.0	1	Manually Perforated Schedule 40 PVC

APPENDICES

APPENDIX A

SOIL BORING LOGS

SOIL BOREHOLE LOG

SITE NAME AND LOCATION: MIDDLE PENINSULA LANDFILL AND RECYCLING FACILITY GLOUCESTER, VIRGINIA FILE NAME: 33538-B1.LOG PROJECT NUMBER: 33538.105 DATUM: FT-MSL GROUND ELEV.: 90.8	DRILLING METHOD: HOLLOW STEM AUGER (HSA)				BORING NUMBER:		
	4.25" ID				GP-101		
	8.5" OD						
	SAMPLING METHOD: SPLIT SPOON (SPT)				Sheet 1 of 1		
	5' INTERVALS				DRILLING		
				START		FINISH	
WATER LEVEL				TIME		TIME	
				15:15		16:00	
DATE				DATE		DATE	
				10/4/95		10/4/95	
CASING DEPTH							

DRILL RIG: CME-ATV		SURFACE CONDITIONS: WOODED AREA	
ANGLE: VERTICAL		BEARING: N 3718382.91	
SAMPLE HAMMER: 140 pounds in.-lbs.		E 12026396.39	

DEPTH IN FEET	PID (ppm)	RECOVERY (%)	LITHOLOGY	DESCRIPTION OF MATERIAL	SAMPLE NUMBER	BLOWS per 6 INCHES	TEST RESULTS				
							WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	SPECIFIC GRAVITY	OTHER TESTS
				CLAYEY SILT (MH): YELLOWISH-BROWN, GRAY MOTTLES, FIRM, BRITTLE, DRY	S-1	2,4 4,6					
5				CLAYEY-SAND (SC): BROWNISH-YELLOW, GRAY MOTTLES, TRACE SILT, VERY DENSE, HARD, DRY	S-2	11,12 17,14					
				CLAY (CL): STRONG BROWN, TRACE SILT, SLIGHTLY DENSE, STIFF, MOIST							
10				SAND (SM): REDDISH-BROWN, TRACE SILT, TRACE RED CLAY, COARSE, VERY DENSE, MOIST	S-3	22,28 25,16					
				CLAY (CL): REDDISH-BROWN, PINK MOTTLES, TRACE SAND, DENSE, STIFF, MOIST	S-4	10,8 9,16					
15				SAND (SC): LIGHT BROWN, TRACE CLAY, COARSE, DENSE, WET							
				BORING TERMINATED AT 15.0 FEET							
20											

DRILLING CONTRACTOR FISHBURNE

LOGGED BY K.RIDER CHECKED BY M. THOMAS

DATE 10/4/95

SOIL BOREHOLE LOG

SITE NAME AND LOCATION:

MIDDLE PENINSULA LANDFILL AND
RECYCLING FACILITY
GLOUCESTER, VIRGINIA

FILE NAME:

33536-B2.LOG

PROJECT NUMBER:

33536.105

DRILLING METHOD: HOLLOW STEM AUGER (HSA)

4.25" ID

8.5" OD

SAMPLING METHOD: SPLIT SPOON (SPT)

5' INTERVALS

BORING NUMBER:

GP-102

Sheet 1 of 1

DRILLING

START

FINISH

WATER LEVEL

TIME

DATE

CASING DEPTH

TIME

TIME

14:20

15:00

DATE

DATE

10/4/95

10/4/95

DATUM: FT-MSL

GROUND ELEV.: 92.6

DRILL RIG: CME-ATV

SURFACE CONDITIONS: WOODED AREA

ANGLE: VERTICAL

BEARING:

N 3717897.82

SAMPLE HAMMER: 140 pounds in.-lbs.

E 12026300.36

DEPTH IN FEET	PID (ppm)	RECOVERY (%)	LITHOLOGY	DESCRIPTION OF MATERIAL	SAMPLE NUMBER	BLOWS per 6 INCHES	TEST RESULTS				
							WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	SPECIFIC GRAVITY	OTHER TESTS
				SILT (ML): GRAY, TRACE CLAY, TRACE SAND, STIFF, BRITTLE, DRY	S-1	1,4 6,4					
5				CLAY (CL-ML): YELLOWISH-RED, RED MOTTLES, TRACE SILT, STIFF TO VERY STIFF, MOIST	S-2	10,12 8,8					
				CLAY (CL-CH): REDDISH-BROWN, RED-LIGHT GREY MOTTLES, TRACE SAND, STIFF, SLIGHTLY MOIST							
10				SAND (SM): YELLOWISH-RED, TRACE CLAY, COARSE, FIRM, MOIST BORING TERMINATED AT 10.0 FEET	S-3	5,4 4,7					
15											
20											

DRILLING CONTRACTOR: FISHBURN

LOGGED BY: K. RIDER
DATE: 10/4/95
CHECKED BY: M. THOMAS

SOIL BOREHOLE LOG

SITE NAME AND LOCATION:

MIDDLE PENINSULA LANDFILL AND
RECYCLING FACILITY
GLOUCESTER, VIRGINIA

FILE NAME:

33536-B3.LOG

PROJECT NUMBER:

33536.105

DRILLING METHOD: HOLLOW STEM AUGER (HSA)

4.25" ID

8.5" OD

SAMPLING METHOD: SPLIT SPOON (SPT)

5' INTERVALS

BORING NUMBER:

GP-103

Sheet 1 of 1

DRILLING

START

FINISH

TIME

TIME

13:40

14:10

DATE

DATE

10/4/95

10/4/95

DATUM: FT-MSL

GROUND ELEV.: 94.4

CASING DEPTH

DRILL RIG: CME-ATV

SURFACE CONDITIONS: WOODED AREA

ANGLE: VERTICAL

BEARING:

N 3717610.58

SAMPLE HAMMER: 140 pounds in.-lbs.

E 12026301.27

DEPTH IN FEET	PID (ppm)	RECOVERY (%)	LITHOLOGY	DESCRIPTION OF MATERIAL	SAMPLE NUMBER	BLOWS per 6 INCHES	TEST RESULTS				
							WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	SPECIFIC GRAVITY	OTHER TESTS
				SILT (MH): DARK GRAY, SOFT, BRITTLE, MOIST	S-1	1.1 2.4					
5				SILT (ML-CL): STRONG BROWN, VERY CLAYEY, FIRM, SLIGHTLY MOIST	S-2	3.4 3.3					
10				CLAY (CL-ML): REDDISH-YELLOW, SLIGHTLY SILTY, GRAY MOTTLES, FIRM, MOIST NOTE: THIN LAYER OF RED SAND, MOIST AT 10 FEET	S-3	3.6 7.6					
				CLAY (CH): REDDISH-YELLOW, RED-REDDISH GRAY MOTTLES, FIRM TO STIFF, VERY MOIST							
15				SAND (SM): VERY PALE BROWN, COARSE, LOOSE, VERY MOIST BORING TERMINATED AT 15.0 FEET	S-4	2.3 4.5					
20											

DRILLING CONTRACTOR FISHBURNE

LOGGED BY K.RIDER
DATE 10/4/95
CHECKED BY M. THOMAS

SOIL BOREHOLE LOG

SITE NAME AND LOCATION:

MIDDLE PENINSULA LANDFILL AND
RECYCLING FACILITY
GLOUCESTER, VIRGINIA

FILE NAME:

33536-B4.LOG

PROJECT NUMBER:

33536.105

DRILLING METHOD: HOLLOW STEM AUGER (HSA)

4.25" ID

8.5" OD

SAMPLING METHOD: SPLIT SPOON (SPT)

5' INTERVALS

BORING NUMBER:

GP-104

Sheet 1 of 1

DRILLING

START

FINISH

TIME

TIME

12:45

13:30

DATE

DATE

10/4/95

10/4/95

DATUM: FT-MSL

GROUND ELEV.: 98.0

DRILL RIG: CME-ATV

SURFACE CONDITIONS: WOODED AREA

ANGLE: VERTICAL

BEARING:

N 3717368.44

SAMPLE HAMMER: 140 pounds in.-lbs.

E 12026326.47

DEPTH IN FEET	PID (ppm)	RECOVERY (%)	LITHOLOGY	DESCRIPTION OF MATERIAL	SAMPLE NUMBER	BLOWS per 6 INCHES	TEST RESULTS				
							WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	SPECIFIC GRAVITY	OTHER TESTS
				SILT (ML): GRAY, TRACE CLAY, BLACK MOTTLES, FIRM TO STIFF, BRITTLE, SLIGHTLY MOIST	S-1	3,3 4,6					
				CLAY (CL-ML): REDDISH-YELLOW, SILTY, STIFF, DRY							
5				SAND (SM): YELLOWISH-RED, TRACE SILT, COARSE, FIRM, SLIGHTLY MOIST	S-2	5,4 9,9					
				CLAY (CL): REDDISH-YELLOW, RED MOTTLES, HARD, DRY							
10				COLOR CHANGE TO RED, STRONG BROWN MOTTLES, WHITE SAND LAYERS, HARD, DRY	S-3	24,26 80,50+					
				COLOR CHANGE TO STRONG BROWN, WITH YELLOWISH-RED SAND, HARD, DRY							
15				SAND (SM): PINKISH-WHITE, TRACE SILT, REDDISH-YELLOW MOTTLES, COARSE, VERY FIRM, DRY	S-4	10,15 14,16					
				SAND (SC): YELLOWISH-RED, BROWN CLAY MOTTLES, COARSE, VERY FIRM, SLIGHTLY MOIST							
20				SAND (SM): REDDISH-BROWN, SILTY, TRACE CLAY, DARK REDDISH BROWN MOTTLES, COARSE, FIRM, SLIGHTLY MOIST	S-5	7,8 14,14					
				BORING TERMINATED AT 21.5 FEET							
25											

DRILLING CONTRACTOR: FISHBURNE

LOGGED BY: K. RIDER
DATE: 10/4/95
CHECKED BY: M. THOMAS

SOIL BOREHOLE LOG

SITE NAME AND LOCATION:

MIDDLE PENINSULA LANDFILL AND
RECYCLING FACILITY
GLOUCESTER, VIRGINIA

FILE NAME:

33538-B5.LOG

PROJECT NUMBER:

33538.105

DRILLING METHOD: HOLLOW STEM AUGER (HSA)

4.25" ID

8.5" OD

SAMPLING METHOD: SPLIT SPOON (SPT)

5' INTERVALS

BORING NUMBER:

GP-105

Sheet 1 of 1

DRILLING

START

FINISH

WATER LEVEL

TIME

DATE

CASING DEPTH

TIME

10:00

DATE

10/4/95

TIME

10:35

DATE

10/4/95

DATUM: FT-MSL

GROUND ELEV.: 96.7

DRILL RIG: CME-ATV

SURFACE CONDITIONS: OPEN FIELD

ANGLE: VERTICAL

BEARING:

N 3718170.45

SAMPLE HAMMER: 140 pounds in.-lbs.

E 12026899.78

DEPTH IN FEET	PID (ppm)	RECOVERY (%)	LITHOLOGY	DESCRIPTION OF MATERIAL	SAMPLE NUMBER	BLOWS per 6 INCHES	TEST RESULTS				
							WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	SPECIFIC GRAVITY	OTHER TESTS
				SAND (SM): DARK OLIVE GRAY, SOME SILT, FIRM, DRY	S-1	7.9 8.7					
				CLAY (CL-ML): BROWNISH-YELLOW, SLIGHTLY SANDY, GRAY MOTTLES, SOFT TO FIRM, SLIGHTLY MOIST							
5				NOTE: IRON PAN OBSERVED		3.2 4.5					
				CLAY (CL): LIGHT GRAY, TRACE SILT, SANDY, FIRM, SLIGHTLY MOIST							
10				SAND (SP-SM): REDDISH-YELLOW, TRACE SILT, TRACE CLAY, DARK RED MOTTLES, LOOSE TO FIRM, BRITTLE, SLIGHTLY MOIST	S-2	2.4 5.6					
				SAND (SM): STRONG BROWN, SOME SILT, RED-GREY MOTTLES, FIRM, MOIST							
15				BORING TERMINATED AT 15.0 FEET	S-3	6.7 12.14					
20											

DRILLING CONTRACTOR FISHBURN

LOGGED BY K. RIDER
DATE 10/4/95
CHECKED BY M. THOMAS

APPENDIX B

GAS PROBE CONSTRUCTION LOGS

File Name: 33536-b1.LOG

Survey Coords Elevation Ground Level 90.8

Top of Casing 93.26

Construction Time Log

Total Depth: 15.00

Borehole Diameter: 8.5 inches

Casing Stickup Height: 2.99 FEET

Driller: Fishburne

GLOUCESTER, VIRGINIA

Rig: A TV-CME

Bit (s): BULLET TEETH CUTTERHEAD

Drilling Fluid: NONE

Protective Casing: 6" SQUARE ALUMINUM

Well Design & Specifications

Basis: Geologic Log ☒ Geophysical Log ☐

Casing String (s): C = Casing S = Screen

Depth	String (s)	Elevation
+2.99 - 5.0	C ₁	-
5.0 - 14.0	S ₁	-
-		-
-		-
-		-

Casing: C1 5.0' - +2.99'

1" DIAMETER SCHEDULE 40 PVC

Casing: C2

Screen: S1 14.0'-5.0'

1" DIA SCH 40 PVC, 3/16" DIA PERF.

Screen: S2

Filter Pack: 15.0'-5.0'

1/8" PEA GRAVEL FROM RAPPAHANNOCK

Grout Seal: 3.0'-0.0'

Bentonite Seal: 5.0'-3.0'

Comments

FILE NAME: 33536-W1.LOG

Task	Start		Finish	
	Date	Time	Date	Time
DRILLING HSA:	10/4/95	15: 15	10/4/95	16: 00
WELL				
INSTALLATION:	10/4/95	16: 00	10/4/95	17: 00

Well Development

N/A

FID

N/A

Time	pH	Spec. Cond.	Temp (C)

Recovery Data

$$Q = N/A$$

N/A

T.D. = 15.00 ft.

SITE NAME **MIDDLE PENINSULA LANDFILL & RECYCLING**
LOCATION **FACILITY - GLOUCESTER, VIRGINIA**

W1 000-1

SUPERVISED BY F. DRUMMOND
DATE 10/4/95 CHECKED BY _____

WELL No. GP-102

33536.b2.LOG

GAS PROBE CONSTRUCTION SUMMARY

Survey Coords (N,E) 3717897.82, 12026300.36 Elevation Ground Level 92.6

Top of Casing 95.59

Drilling Summary

Total Depth: 10.00

Borehole Diameter: 8.5 inches

Casing Stickup Height: 2.99 FEET

Driller: Fishburne

CHESAPEAKE, VIRGINIA

Rig: ATV-CME

Bit (s): BULLET TEETH CUTTERHEAD

Drilling Fluid: NONE

Protective Casing: 6" SQUARE ALUMINUM

Construction Time Log

Task	Start		Finish	
	Date	Time	Date	Time
DRILLING HSA:	10/4/95	14: 20	10/4/95	15: 00
WELL INSTALLATION:	10/4/95	15: 00	10/4/95	15: 55

Well Design & Specifications

Basis: Geologic Log ☒ Geophysical Log ☐

Casing String (s): C = Casing S = Screen

Depth	String (s)	Elevation
+2.99 - 4.5	C ₁	-
4.5 - 9.5	S ₁	-
-	-	-
-	-	-
-	-	-

Casing: C1 4.5' - +2.99'

1-inch diameter Schedule 40 PVC

Screen: S1 9.5' - 4.5'

1-inch diameter Schedule 40 PVC

hand-drilled 3/16-inch diameter perforations

Filter Pack: 9.5' - 4.5'

1/8-inch Pea Gravel from Rappahannock

Grout Seal: 2.5' - 0.0'

Bentonite Seal: 4.5' - 2.5'

Well Development

N/A

Stabilization Test Data

N/A

Time	pH	Spec. Cond.	Temp (C)

Recovery Data

Q = N/A

S₀ = N/A

Comments

FILE NAME: 33536-W2.LOG

T.D. = 10.00 ft.

SITE NAME MIDDLE PENINSULA LANDFILL & RECYCLING
LOCATION FACILITY - GLOUCESTER, VIRGINIA

WI 000-1

F. DRUMMOND

SUPERVISED BY
DATE 10/4/95
CHECKED BY

WELL No. GP-10333536.b3.LOG**GAS PROBE CONSTRUCTION SUMMARY**Survey Coords (N,E) 3717610.58, 12026301.27Elevation Ground Level 94.4Top of Casing 97.31**Drilling Summary**

Total Depth: 15.00

Borehole Diameter: 8.5 inches

Casing Stickup Height: 2.91 FEET

Driller: Fishburne

CHESAPEAKE, VIRGINIA

Rig: ATV-CME

Bit (s): BULLET TEETH CUTTERHEAD

Drilling Fluid: NONE

Protective Casing: 6" SQUARE ALUMINUM

Construction Time Log

Task	Start		Finish	
	Date	Time	Date	Time
DRILLING HSA:	10/4/95	13: 40	10/4/95	14: 10
WELL				
INSTALLATION:	10/4/95	14: 10	10/4/95	14: 55

Well Design & SpecificationsBasis: Geologic Log ☒ Geophysical Log ☐

Casing String (s): C = Casing S = Screen

Depth	String (s)	Elevation
+2.91 - 5.0	C ₁	-
5.0 - 14.0	S ₁	-
-		-
-		-
-		-

Casing: C1 5.0' - +2.91'

1-inch diameter Schedule 40 PVC

Screen: S1 14.0' - 5.0'

1-inch diameter Schedule 40 PVC

hand-drilled 3/16-inch diameter perforations

Filter Pack: 15.0' - 5.0'

1/8-inch Pea Gravel from Rappahannock

Grout Seal: 3.0' - 0.0'

Bentonite Seal: 5.0' - 3.0'

Well Development

N/A

Stabilization Test Data

N/A

Time	pH	Spec. Cond.	Temp (C)

Recovery Data

Q = N/A

S₀ = N/A**Comments**

FILE NAME: 33536-W3.LOG

T.D. = 15.00 ft.

SITE NAME MIDDLE PENINSULA LANDFILL & RECYCLING
LOCATION FACILITY - GLOUCESTER, VIRGINIA

WI 000-1

SUPERVISED BY F. DRUMMOND
DATE 10/4/95
CHECKED BY _____

File Name: 33536-b4.LOG

Survey Coords Elevation Ground Level 96.0

Top of Casing 98.98

Drilling Summary

Total Depth: 21.5

Borehole Diameter: 8.5 inches

Casing Stickup Height: 2.98 FEET

Driller: Fishburne

GLOUCESTER, VIRGINIA

Rig: A TV-CME

Bit (s): BULLET TEETH CUTTERHEAD

Drilling Fluid: NONE

Protective Casing: 6" SQUARE ALUMINUM

Well Design & Specifications

Basis: Geologic Log ☒ Geophysical Log ☐

Casing String (s): C = Casing S = Screen

Depth	String (s)	Elevation
+2.98 - 11.0	C ₁	-
11.0 - 21.0	S ₁	-
-		-
-		-
-		-

Casing: C1 11.0' - +2.98'

1" DIAMETER SCHEDULE 40 PVC

Casing: C2

Screen: S1 21.0'-11.0'

1" DIA SCH 40 PVC, 3/16 DIA PERF.

Screen: S2

Filter Pack: 21.5'-11.0'

1/8" PEA GRAVEL FROM RAPPAHANNOCK

Grout Seal: 3.0'-0.0'

Bentonite Seal: 5.0'-3.0'

BACKFILL: 11.0'-5.0'

Construction Time Log

Task	Start		Finish	
	Date	Time	Date	Time
DRILLING HSA:	10/4/95	12: 45	10/4/95	13: 30
WELL				
INSTALLATION:	10/4/95	13: 30	10/4/95	14: 15

Well Development

N/A

FID

N/A

Time	pH	Spec. Cond.	Temp (C)

Recovery Data

$$Q = N/A$$

N/A

Comments

FILE NAME: 33536-W4.LOG

T.D. = 21.5 ft.

SITE NAME	<u>MIDDLE PENINSULA LANDFILL & RECYCLING</u>
LOCATION	<u>FACILITY - GLOUCESTER, VIRGINIA</u>

WI 000-1

SUPERVISED BY F. DRUMMOND
DATE 10/4/95 CHECKED BY _____

WELL No. GP-105

33536.b5.LOG

GAS PROBE CONSTRUCTION SUMMARY

Survey Coords (N,E) 3718170.45, 12026899.78 Elevation Ground Level 96.7

Top of Casing 99.65

Drilling Summary

Total Depth: 15.00

Borehole Diameter: 8.5 inches

Casing Stickup Height: 2.95 FEET

Driller: Fishburne

CHESAPEAKE, VIRGINIA

Rig: ATV-CME

Bit (s): BULLET TEETH CUTTERHEAD

Drilling Fluid: NONE

Protective Casing: 6" SQUARE ALUMINUM

Construction Time Log

Task	Start		Finish	
	Date	Time	Date	Time
DRILLING HSA:	10/4/95	10: 00	10/4/95	10: 35
WELL INSTALLATION:	10/4/95	10: 35	10/4/95	11: 25

Well Design & Specifications

Basis: Geologic Log ☒ Geophysical Log ☐

Casing String (s): C = Casing S = Screen

Depth	String (s)	Elevation
+2.95 - 5.0	C ₁	-
5.0 - 14.0	S ₁	-
-	-	-
-	-	-
-	-	-

Casing: C1 5.0'-2.95'

1-inch diameter Schedule 40 PVC

Screen: S1 14.0'-5.0'

1-inch diameter Schedule 40 PVC

hand-drilled 3/16-inch diameter perforations

Filter Pack: 15.0'-5.0'

1/8-inch Pea Gravel from Rappahannock

Grout Seal: 3.0'-0.0'

Bentonite Seal: 5.0'-3.0'

Well Development

N/A

Stabilization Test Data

N/A

Time	pH	Spec. Cond.	Temp (C)

Recovery Data

Q = N/A

S₀ = N/A

Comments

FILE NAME: 33536-W5.LOG

T.D. = 15.00 ft.

SITE NAME MIDDLE PENINSULA LANDFILL & RECYCLING
LOCATION FACILITY - GLOUCESTER, VIRGINIA

WI 000-1

SUPERVISED BY F. DRUMMOND
DATE 10/4/95
CHECKED BY

GAS PROBE INSTALLATION REPORT

Prepared For:

**MIDDLE PENINSULA LANDFILL
AND RECYCLING FACILITY**
a division of Waste Management Disposal Services of Virginia, Inc.
3714 Waste Management Way
Glenns, Virginia. 23149

Prepared by:

KING GEOSCIENCES Inc.
672 Southwick Road.
Somerdale New Jersey, 08083
May 1999

TABLE OF CONTENTS

Section**Page****1.0 INTRODUCTION.....1****2.0 GAS PROBE INSTALLATION2****Tables****Following Text****1. SURVEY AND GAS PROBE INSTALLATION DATA.....****APPENDIX A GAS PROBE BOREHOLE AND INSTALLATION LOGS**

1.0 INTRODUCTION

At the request of Middle Peninsula Landfill and Recycling Facility KING GEOSCIENCES Inc. (KGI) completed the installation of six gas probes GP201 through GP206 around the east and north sides of the permitted landfill area.

Drilling services were provided by Fishburne Drilling of Chesapeake, Virginia. The site work was completed during March 2, 3 and 4, 1999. Following installation of the gas probes the locations were surveyed by Flora Surveying Associates Inc.

This report provides brief descriptions of the site work and presents the gas probe boring and installation logs.

2.0 GAS PROBE INSTALLATION

Installation of gas probes 201 through 206 was completed on March 2, 3 and 4 1999. Fishburne Drilling of Chesapeake, Virginia provided drilling services. Drilling Equipment consisted of a CME 45 hollow stem auger drilling rig on an all terrain tracked vehicle with 4 inch I.D. Hollow Stem augers and 2 inch diameter split spoon soil sampling equipment with an automatic trip hammer. Soils borings were monitored full time by a geologist from King Geosciences Inc.

The hole locations were staked by Flora Surveying prior to site work. Due to wet ground conditions and ground surface slope two gas probes were installed a few feet from the originally surveyed locations. All other gas probes were installed within a few inches of the originally surveyed locations.

The boring for the gas probes were completed in the following manner:

- The boring was advanced using 4 inch ID - 8 inch OD hollow stem augers;
- Split spoon samples were taken at 5 foot intervals starting at 5 feet depth below ground surface using an automatic 140 pound trip hammer and a two inch diameter split spoon. Blow counts were taken every 6 inches for a total penetration of two feet. As in a the Standard Penetration test N values were obtained for the 6 inch to 18 inch section of the test;
- Recovered samples were described and any indications of groundwater noted on the log.
- Hollow stem augers were advanced until the soils recovered from the split spoon or the arisings were wet with groundwater.

The gas probes were constructed in the following manner:

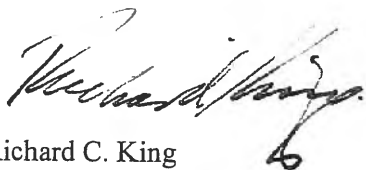
- About one foot of Morie #0 sand was placed in the borehole through the augers;
- Between 15 feet and twenty five feet of 1 inch diameter Schedule 40 PVC with ¼ inch diameter holes were installed in the borehole with between 5 feet to 10 feet of 1 inch diameter Schedule 40 PVC riser pipe were installed through the augers.
- Three eighths inch pea gravel was added through the augers to surround the perforated section of the PVC well screen to a depth just above the top of the perforated section of the pipe. A 6 inch to two foot section of Morie #0 sand was then added above the pea gravel as the augers were removed to bring the sand up to a depth of 3 feet to 7 feet below ground surface and provide a filter below the bentonite seal;
- Following removal of the augers about one to two feet of Holeplug bentonite gravel was added and hydrated with water supplied by the landfill;

- The hole was then completed to surface with cement bentonite grout (approximately five pounds of bentonite to 95 pounds of Portland cement);
- A five foot long 4 inch square steel protective casing was installed in the hole with a stickup of about 2 to 3 feet.
- A two foot long section of twelve inch diameter Sonotube was then set into the ground to a depth of about six to 12 inches and backfilled with concrete between the Sonotube and the steel protective casing and around the Sonotube to provide support for the concrete surface seal and protective casing support.

A one inch PVC cap with an 7/16 inch NPT thread hole was added top the top of each gas probe and a PLCD 240-04 coupling screwed into each cap. Detailed logs of the soils encountered during drilling and gas probe construction are provided in Appendix A.

Following gas probe construction Flora Surveying surveyed ground surface, borehole horizontal coordinates and the elevation of the top of the PVC riser pipe. This information is provided on Table 1.

We trust this report is adequate for your current requirements.



Richard C. King
Principal
for

KING GEOSCIENCES Inc.

**TABLE 1
MIDDLE PENINSULA LANDFILL
GAS PROBE INSTALLATIONS**

Well Number	GP201	GP202	GP203	GP204	GP205	GP206
Ground Surface Elevation	104.26	111.02	115.06	119.33	91.69	90.68
Northing	3718646.18	37187719.78	371891.51	3719127.56	3718234.66	3717760.62
Easting	12029910.62	12029420.65	12028937.22	12028799.79	12030118.46 12028799.79 12030117.63	12030117.63
Top of PVC	107.33	113.45	117.65	121.44	94.54	93.73
Stick up PVC	3.07	2.43	2.59	2.11	2.85	3.05
Depth to Water on 3/4-5/99	25.96	27.02	27.36	28.00	15.80	18.40
Borehole Depth	26.00	31.00	31.00	31.00	21.00	21.00
Screen Depth	23.00	29.50	29.50	29.50	19.00	18.60
Screen Length	20.00	25.00	25.00	25.00	10.00	10.00

Gas Probes Surveyed by Flora Surveying

APPENDIX A
GAS PROBE BOREHOLES AND INSTALLATION LOGS

Project: Gas Probe Installation

Client: Waste Management

Well #: GP201

Site: Middle Peninsula Landfill

Vertical Datum: Geodetic

Horizontal Datum: State Plane

Drilling Method: H/S Auger

Driller: Fishburne Drilling

Northing: 3718646.18

Easting: 12029910.62

Borehole Diameter: 8 inch

Drilling Date: 3/3/99

Geologist Richard King

Depth	Symbol	Description	Depth Elev. (ft)	SPT	Recovery	Well Installation Details	Well Log
0		Ground Surface	0				
		Sod and TOPSOIL	104.3				
2						4 inch square steel protective cover five feet long. Stick up 2.5 feet	
4		Light buff brown fine SAND with silt and trace clay				PLCD 240-04 Gas Coupling top of PVC	
6			7	5	100	Top of PVC Elevation 107.33 feet msl	
						Stick up 2.4 feet	
8			97.26			12 inch diameter Sono Tube 2 feet	
10		Light buff medium grained SAND trace silt		10	100	Concrete + 1 foot to 5 feet	
12						3/8 inch Holeplug Bentonite gravel	
14			13			3 feet to 5 feet	
16		Light buff brown with brown lenses medium grained SAND trace silt	91.26	6	100	Morie #0 Filter Sand 5 feet to 7 feet	
18			18			PVC Sch 40 1 inch dia. riser pipe	
20			86.26			7 feet to + 2.4 feet	
22		Red brown medium grained SAND. Moist. Becoming wet at 23 feet		4	100	3/8 inch Gravel pack 8 feet to 25 feet	
24						PVC Sch 40 perforated Sch 40 1 inch dia. screen 7 feet to 23 feet	
26			26	12	100	End cap	
28		End of Borehole	78.26				
30							
32							
34							
36							
38							
40							

Log Revision Date: 3/8/99

File Name: GP201.log

KING GEOSCIENCES
Inc.

Project No: 99005

Sheet: 1 of 1

Project: Gas Probe Installation

Client: Waste Management

Well #: GP202

Site: Middle Peninsula Landfill

Vertical Datum: Geodetic

Horizontal Datum: State Plane

Drilling Method: H/S Auger

Driller: Fishburne Drilling

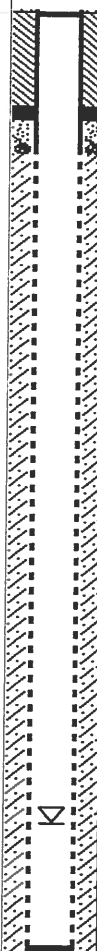
Northing: 3718719.78

Easting: 12029420.65

Borehole Diameter: 8 inch

Drilling Date: 3/4/99

Geologist Richard King

Depth	Symbol	Description	Depth Elev. (ft)	SPT	Recovery	Well Installation Details	Well Log
0		Ground Surface	0				
		Sod and TOPSOIL	11.1				
2		Red brown fine to medium grained SAND with trace silt and clay	7			4 inch square steel protective cover five feet long. Stick up 2.7 feet PLCD 240-04 Gas Coupling at top of PVC	
4				17	100	Top of PVC at elevation 113.45 feet msl Stick up 2.3 feet	
6						12 inch diameter Sono Tube 2 feet	
8		Red brown and buff mottled fine grained SAND with trace silt	104			Concrete + 1 foot to 3 feet	
10				23	100	3/8 inch Holeplug Bentonite gravel	
12						3 feet to 3.5 feet Morie #0 Filter Sand 3.0 feet to 3.5 feet	
14		Red brown medium grained SAND	15			PVC Sch 40 1 inch dia. riser pipe	
16				14	100	7 feet to + 2.4 feet	
18						3/8 inch Gravel pack 7 feet to 30 feet	
20		Red and Buff brown fine to medium grained SAND with silt and trace clay	23			PVC Sch 40 perforated Sch 40 1 inch dia. screen 4.5 feet to 29.5 feet	
22				11	100		
24							
26		Red brown medium grained SAND trace silt	28				
28				6	100		
30							
32		End of Borehole	80.02	7	100	End cap	
34						Depth to Water below top PVC 27.02 feet 12.00 am 3/4/99	
36						Ground surface elev. 111.02 feet msl	
38							
40							

Log Revision Date: 3/8/99

File Name: GP202.log

KING GEOSCIENCES
Inc.

Project No: 99005

Sheet: 1 of 1

Project: Gas Probe Installation

Client: Waste Management

Well #: GP203

Site: Middle Peninsula Landfill

Vertical Datum: Geodetic

Horizontal Datum: State Plane

Drilling Method: H/S Auger

Driller: Fishburne Drilling

Northing: 3718791.51

Easting: 12028937.22

Borehole Diameter: 8 inch

Drilling Date: 3/3/99

Geologist Richard King

Depth	Symbol	Description	Depth Elev. (ft)	SPT	Recovery	Well Installation Details	Well Log
0		Ground Surface	0				
		Sod and TOPSOIL	115.1				
2		Light buff and brown medium grained SAND with silt and clay	7			4 inch square steel protective cover five feet long. Stick up 2.4 feet	
4						PLCD 240-04 Gas Coupling at top of PVC	
6				12	100	Top of PVC at elevation 117.65 feet msl	
8		Light tan brown with red clast of v fine SAND with silt and trace clay	108.1			Stick up 2.25feet	
10				15	100	12 inch diameter Sono Tube 2 feet	
12						Concrete + 1 foot to 3 feet	
14		Tan brown v fine SAND with silt and trace clay	102.1			3/8 inch Holeplug Bentonite gravel	
16						3 feet to 3.5 feet	
18						Morie #0 Filter Sand 3.0 feet to 3.5 feet	
20						PVC Sch 40 1 inch dia. riser pipe	
22		Light brown medium grained SAND	93.06			7 feet to + 2.4 feet	
24						3/8 inch Gravel pack 7 feet to 30 feet	
26				6	100	PVC Sch 40 perforated Sch 40 1 inch dia. screen 4.5 feet to 29.5 feet	
28		Light tan brown fine to medium grained SAND trace silt trace clay	88.06				
30							
32				13	100		
34		End of Borehole	84.06				
36				5	100	End cap	
38						Depth to Water below top PVC	
40						27.36 feet 11.55 am 3/4/99	
						Ground surface elev. 115.06 feet msl	

Log Revision Date: 3/8/99

KING GEOSCIENCES
Inc.

Project No: 99005

File Name: GP203.log

Sheet: 1 of 1

Project: Gas Probe Installation

Client: Waste Management

Well #: GP204

Site: Middle Peninsula Landfill

Vertical Datum: Geodetic

Horizontal Datum: State Plane

Drilling Method: H/S Auger

Driller: Fishburne Drilling

Northing: 3719127.56

Easting: 12028799.79

Borehole Diameter: 8 inch

Drilling Date: 3/3/99

Geologist Richard King

Depth	Symbol	Description	Depth Elev. (ft)	SPT	Recovery	Well Installation Details	Well Log
0		Ground Surface	0				
		Sod and TOPSOIL	119.3				
2		Light brown SILT with fine grained sand and clay	7			4 inch square steel protective cover five feet long. Stick up 2.7 feet	
4						PLCD 240-04 Coupling at top of PVC	
6				3	100	Top of PVC Elevation 121.44 feet msl	
8		Light brown fine grained SAND with silt	112.3			Stick up 2.5 feet	
10						12 inch diameter Sono Tube 2 feet	
12						Concrete + 1 foot to 3 feet	
14		Light brown very fine grained SAND with silt	106.3	11	100	3/8 inch Holeplug Bentonite gravel	
16						3 feet to 3.5 feet	
18						Morie #0 Filter Sand 3.0 feet to 3.5 feet	
20		Light buff brown v fine SAND . Moist	101.3			PVC Sch 40 1 inch dia. riser pipe	
22						7 feet to + 2.4 feet	
24				6	100	3/8 inch Gravel pack 7 feet to 30 feet	
26		Light buff brown v fine grained SAND and silt trace clay.	96.33			PVC Sch 40 perforated Sch 40 1 inch dia. screen 4.5 feet to 29.5 feet	
28							
30				5	100		
32		Buff brown fine grained SAND	92.33				
34							
36				4	100		
38		End of Borehole	88.33				
40							
				8	100	End cap	
						Depth to Water below top PVC	
						28.00 feet 11.30 am 3/4/99	

Log Revision Date: 3/8/99

KING GEOSCIENCES
Inc.

Project No: 99005

File Name: GP204.log

Sheet: 1 of 1

Project: Gas Probe Installation

Client: Waste Management

Well #: GP205

Site: Middle Peninsula Landfill

Vertical Datum: Geodetic

Horizontal Datum: State Plane

Drilling Method: H/S Auger

Driller: Fishburne Drilling



Northing: 37118234.66

Easting: 12030117.63

Borehole Diameter: 8 inch

Drilling Date: 3/2/99

Geologist Richard king

Depth	Symbol	Description	Depth Elev. (ft)	SPT	Recovery	Well Installation Details	Well Log
0		Ground Surface	0				
		Sod and TOPSOIL	91.69				
2		Light buff brown fine SAND with silt and trace clay	7	8	100	4 inch square steel protective cover five feet long. Stick up 3.1 feet PLCD 240-04 Coupling at top of PVC	
4						Top of PVC Elevation 94.54 feet msl Stick up 2.9 feet	
6						12 inch diameter Sono Tube 2 feet	
8		Reddish brown medium grained SAND trace silt	13	11	100	Concrete + 1.6 foot to 4.5 feet 3/8 inch Holeplug Bentonite gravel	
10						4.5 feet to 6.5 feet	
12						Morie #0 Filter Sand 4.5 feet to 6.5 feet	
14		Yellow brown fine to medium grained SAND. Moist at 15 feet. Becoming wet at 19 feet	21	2	100	PVC Sch 40 1 inch dia. riser pipe 7 feet to + 2.4 feet 3/8 inch Gravel pack 6.5 feet to 20 feet	
16							
18							
20		End of Borehole	70.69	4	100	PVC Sch 40 perforated Sch 40 1 inch dia. screen 9 feet to 19 feet End cap	
22							
24							
26						Depth to water below top of PVC 15.80 feet 10:00 am 3/3/99	
28							
30							
32							
34							
36							
38							
40							

Log Revision Date: 3/8/99

File Name: GP205.log

KING GEOSCIENCES
Inc.

Project No: 99005

Sheet: 1 of 1

Project: Gas Probe Installation

Client: Waste Management

Well #: GP206

Site: Middle Peninsula Landfill

Vertical Datum: Geodetic

Horizontal Datum: State Plane

Drilling Method: H/S Auger

Driller: Fishburne Drilling

Northing: 3717760.62

Easting: 12030218.01

Borehole Diameter: 8 inch

Drilling Date: 3/2/99

Geologist Richard king

Depth	Symbol	Description	Depth Elev. (ft)	SPT	Recovery	Well Installation Details	Well Log
0		Ground Surface	0				
		Sod and TOPSOIL	90.68				
2		Light buff reddish brown SILT with V. fine SAND and clay	3			4 inch square steel protective cover five feet long. Stick up 3.5 feet PLCD 240-04 Coupling at top of PVC	
4			87.68				
6		Medium reddish brown fine to medium grained SAND. Slightly damp.		13	100	Top of PVC Elevation 93.73 feet msl Stick up 3.3 feet	
8			8			12 inch diameter Sono Tube 2 feet long	
10		Red brown medium SAND becoming bright red with cemented bands	82.68	7	100	Concrete + 1 foot to 4 feet 3/8 inch Holeplug Bentonite gravel 4 feet to 5 feet Morie #0 Filter Sand 5 feet to 6.25 feet	
12			13				
14			77.68			PVC Sch 40 1 inch dia. riser pipe + 3.25 feet to 8.6 feet	
16		Red medium grained SAND trace silt. Moist. Becoming wet at 19 feet		13	100	3/8 inch Gravel pack 6.25 feet to 20 feet	
18							
20			21	3	100	PVC Sch 40 perforated Sch 40 1 inch dia. screen 8.6 feet to 18.6 feet End cap	
22		End of Borehole	69.68				
24							
26						Depth to water below top PVC 18.4 feet 3/3/99 10.05 am	
28							
30							
32							
34							
36							
38							
40							

Log Revision Date: 3/8/99

KING GEOSCIENCES
Inc.

Project No: 99005

File Name: GP206.log

Sheet: 1 of 1



EEE Consulting, Inc.

Environmental, Engineering and Educational Solutions

April 9, 2003

Mr. Jim Loveland, P.E.
Area Engineer
Middle Peninsula Landfill and Recycling Facility
3714 Waste Management Way
Glenns, Virginia 23149

Re: Perimeter Landfill Gas Probe Installation
Middle Peninsula Landfill and Recycling Facility
DEQ Solid Waste Permit No. 572
EEE Project Number: 02-020

Dear Mr. Loveland:

At your request, EEE Consulting, Inc., has coordinated the installation of three new landfill gas monitoring probes at various points around the Middle Peninsula Landfill and Recycling Facility. The new gas probes were installed in accordance with the requirements of Solid Waste Permit No. 572. The new probes are identified as GP-301, GP-302, and GP-303.

The landfill gas probes were installed using truck-mounted continuous flight auger drilling equipment. A seven (7) inch diameter borehole was advanced to the groundwater table elevation and the probe was constructed in the borehole. The probe consisted of 1-inch diameter, schedule 40 PVC extended from the bottom of the borehole to the ground surface. The bottom 10 feet of the pipe was perforated with 1/16-inch diameter holes drilled at approximately 4-inches on center. The bottom of the pipe was fitted with an end cap. Pea gravel was used as backfill around the perforated section of pipe and extended 0.5 to 2.0 feet above the perforations. The remainder of the pipe extending to the ground surface was solid-walled. A 2-foot thick hydrated bentonite plug was backfilled around the pipe two feet below the ground surface. A 4-inch metal casing with a locking cover cemented into the surface completion at the top of the probe. The concrete completion consisted of a 12-inch diameter pad that extended 2 feet below the ground surface. The soils encountered during the drilling of the holes were visually classified in the field by a geotechnical engineer. Descriptions of the soils encountered in the boreholes are presented on the attached logs. In addition, the construction logs of the gas probes are attached..

If you have any questions about this work, please call us at (804) 883-0016. Thank you for using EEE Consulting, we enjoy working with the Waste Management and look forward to being of continued service to you.

Sincerely,

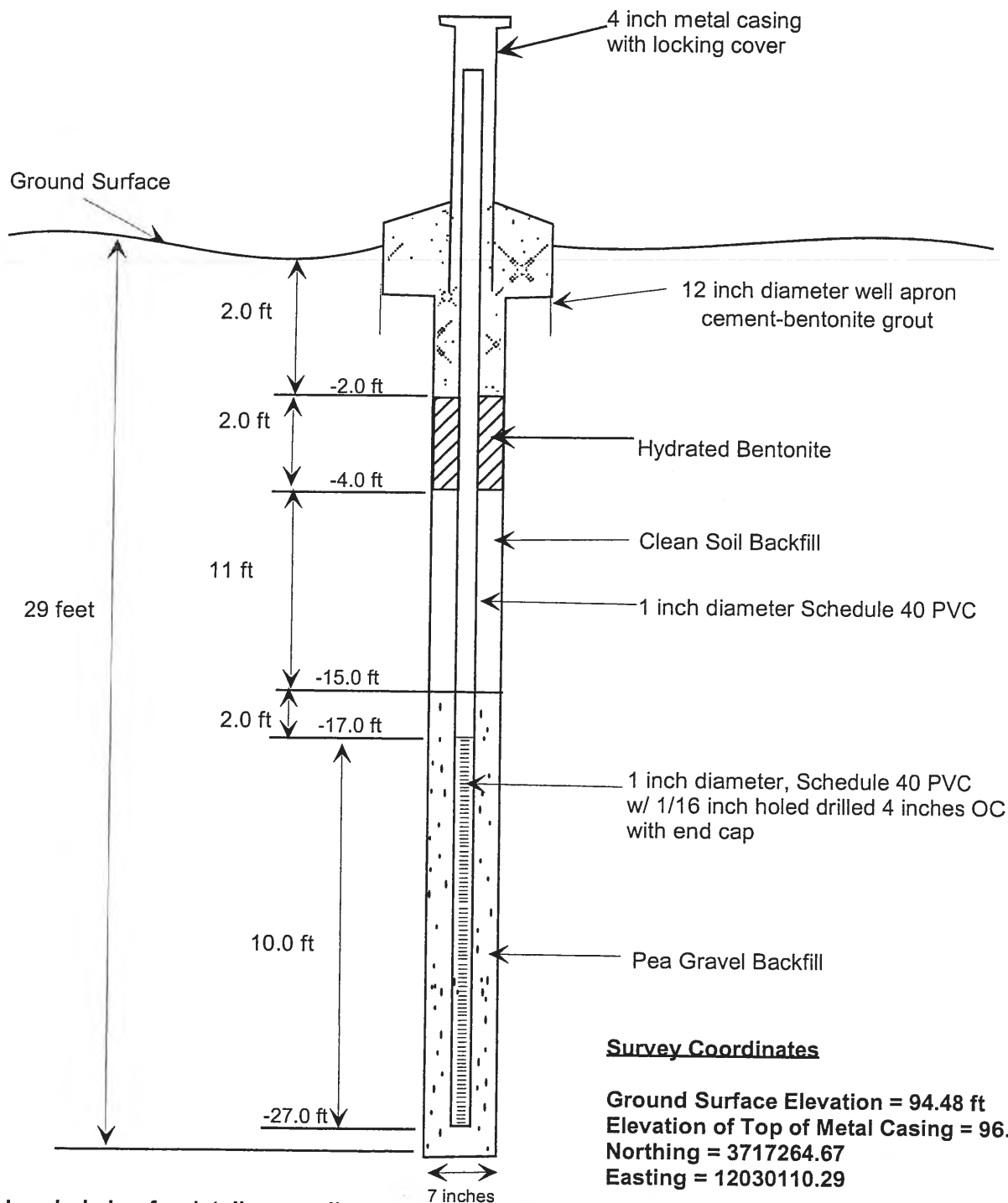
Michael R. Thomas, P.E.
Director of Engineering Services
enclosure

Landfill Gas Monitoring Probe

SITE NAME AND LOCATION: Middle Peninsula Landfill	DRILLING METHOD: Continuous Flight Auger				GAS PROBE NUMBER GP-301	
	3.25-inch ID					
	FILE NAME:	SAMPLING METHOD: Grab				
PROJECT NUMBER: 02-020					DRILLING	
					START	
	WATER LEVEL					TIME
	TIME					
					DATE	
DATE						
DATUM: FT MSL GROUND ELE.: 94.48	CASING DEPTH				12/17/02	

DRILL RIG: CME 45B	SURFACE CONDITIONS freshly timbered
DRILL ANGLE: 90°	DRILLING CONTRACTOR: B&L Drilling
SAMPLE HAMMER TYPE:	LOGGED BY: M. Thomas

DEPTH IN FEET	USCS	DESCRIPTION OF MATERIAL	Comments
5		SAND (SC), fine-grained, clayey, dark yellow brown	Off-set boring about 12 NE of stake elevation on stake 93.97 ft
10		SAND (SP), fine-grained, slightly clayey, dark yellow brown, orange and pink	
15		- grading to a clayey sand (SC) at 14 feet	
20			
25			water encountered at 27 feet at the time of drilling
30			
		Bottom of Boring @ 31 feet	



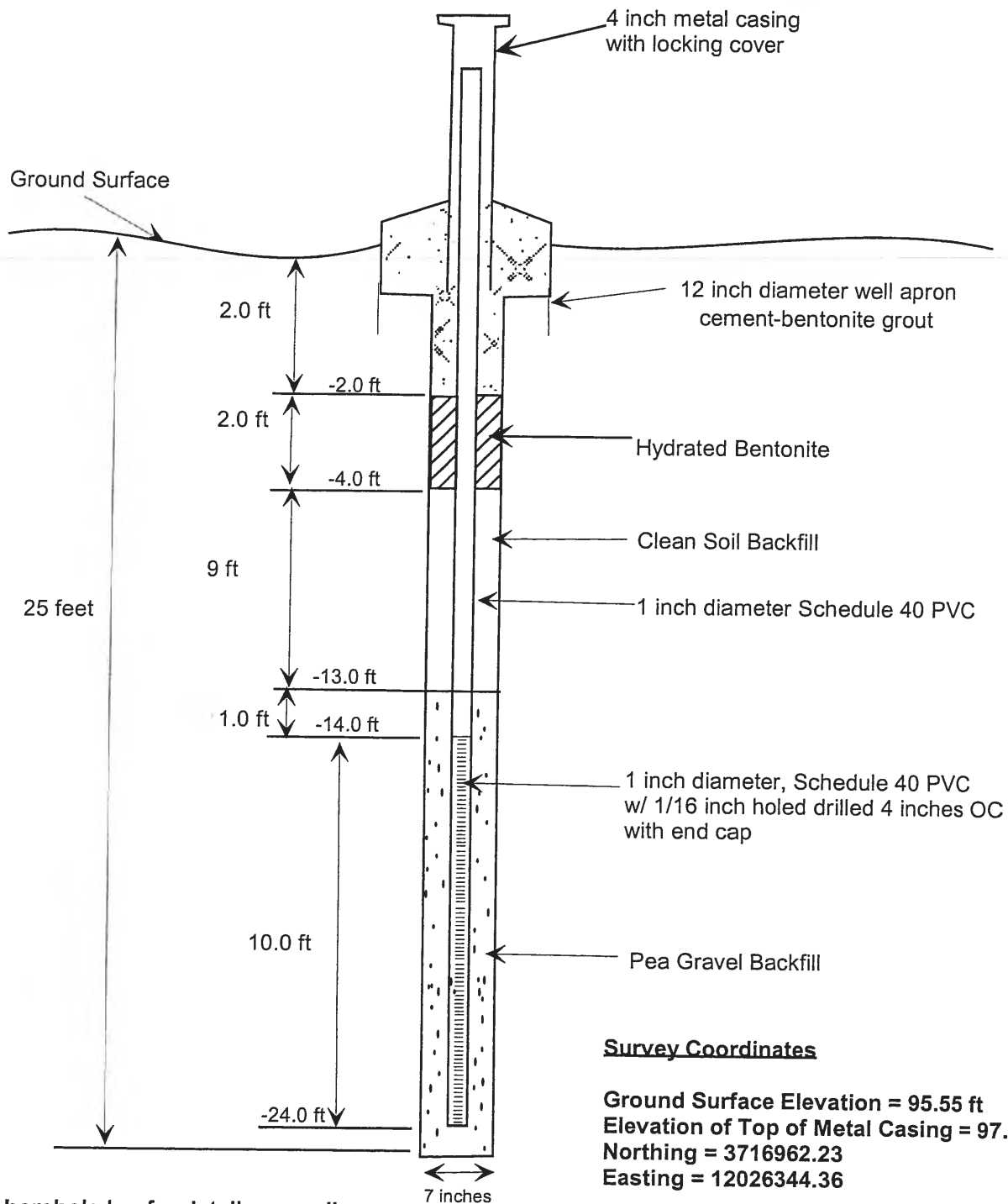
Note: See borehole log for details regarding subsurface conditions.

Landfill Gas Monitoring Probe

SITE NAME AND LOCATION: Middle Peninsula Landfill	DRILLING METHOD: Continuous Flight Auger				GAS PROBE NUMBER GP-302
	3.25-inch ID				
	FILE NAME:	SAMPLING METHOD: Grab			
PROJECT NUMBER: 02-020	WATER LEVEL				DRILLING START TIME
	TIME				
	DATE				
DATUM: FT MSL GROUND ELE.: 95.55 ft		CASING DEPTH		DATE 12/17/02	

DRILL RIG: CME 45B	SURFACE CONDITIONS freshly timbered
DRILL ANGLE: 90°	DRILLING CONTRACTOR: B&L Drilling
SAMPLE HAMMER TYPE:	LOGGED BY: M. Thomas

DEPTH IN FEET	USCS	DESCRIPTION OF MATERIAL	Comments
5		SAND (SC), fine-grained, very clayey, with clay seams, yellow brown	wet conditions encountered @ 21 feet at time of drilling water encountered at 23 feet at the time of well construction
10		SAND (SP), fine- to medium-grained, slightly silty, yellow brown and orange	
15			
20		SAND (SM), fine-grained, silty, light reddish brown, water encountered at 21 feet	
25		becoming clayey with depth	
30		Bottom of Boring @ 26 feet	



Note: See borehole log for details regarding subsurface conditions.



EEE Consulting, Inc.
 Environmental, Engineering and Educational Solutions

GP-302
Construction Detail
Gas Monitoring Probe

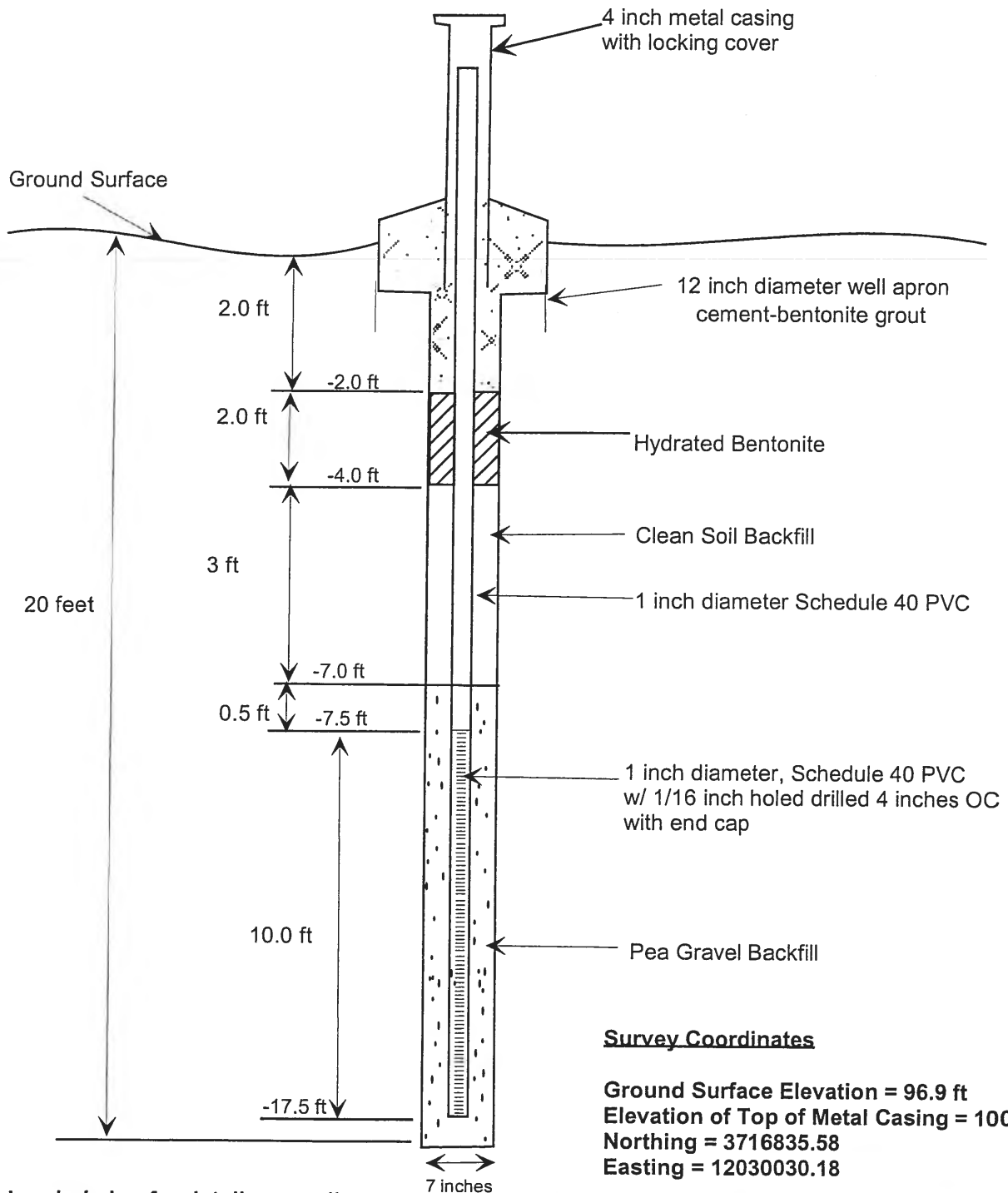
December 2002

Landfill Gas Monitoring Probe

SITE NAME AND LOCATION: Middle Peninsula Landfill	DRILLING METHOD: Continuous Flight Auger				GAS PROBE NUMBER GP-303
	3.25-inch ID				
	FILE NAME:	SAMPLING METHOD: Grab			
				DRILLING	
				START	
PROJECT NUMBER: 02-020		WATER LEVEL			
	TIME				
	DATE				DATE 12/17/02
	DATUM: FT MSL GROUND ELE.: 96.9 ft	CASING DEPTH			

DRILL RIG: CME 45B	SURFACE CONDITIONS freshly timbered
DRILL ANGLE: 90°	DRILLING CONTRACTOR: B&L Drilling
SAMPLE HAMMER TYPE:	LOGGED BY: M. Thomas

DEPTH IN FEET		USCS	DESCRIPTION OF MATERIAL	Comments
0			SAND (SC), fine-grained, very clayey, with thin veins of gray clay, dark orange brown	Boring offset about 30 feet NNE due to poor access due to timbering activity
5			moist	
10			CLAY (CL/CH) silty, slightly sandy yellow brown and orange. Thin veins of fine-grained sand	
15			alternating thin layers of fine-grained sand and clay, yellow brown, orange, and pink	
20				very moist to saturated from 13 feet
25			Bottom of Boring @ 21 feet	
30				



Survey Coordinates

Ground Surface Elevation = 96.9 ft
 Elevation of Top of Metal Casing = 100.52 ft
 Northing = 3716835.58
 Easting = 12030030.18

Note: See borehole log for details regarding subsurface conditions.



November 27, 2013

Project No. 1339-6673.510

Waste Management Disposal Services of Virginia, Inc.
Middle Peninsula Landfill and Recycling Facility
3714 Waste Management Way
Glenns, Virginia 23149

Attention: Sam Nicolai, P.E.
Market Area Engineer

**Re: Installation of Gas Boundary Probes GP-401 and GP-402
Middle Peninsula Landfill and Recycling Facility, Permit No. 572**

Dear Sam:

Golder Associates Inc. (Golder) is providing this letter documenting the installation of gas boundary probes GP-401 and GP-402 at the Middle Peninsula Landfill and Recycling Facility, Permit No. 572. A summary of the project activities is presented below.

Landfill Gas Probe Installation

Prior to mobilization, Golder contacted MISS Utility of Virginia to have the area immediately surrounding the proposed drilling locations marked for public subsurface utilities. Following confirmation of the utility markings, gas probe installation and construction activities were completed September 23 and 24, 2013. The installation activities were observed and recorded by a qualified scientist from Golder. A Site Map indicating the locations of GP-401 and GP-402 is presented as Drawing 1. Additionally, the boring and construction logs are presented in Attachment 1.

The drilling activities were performed by Fishburne Drilling, Inc. using a CME 55 drill rig mounted on a CME 300x tracked frame and 4.25-inch inside diameter (ID) hollow stem augers. During advancement of the soil borings, soil samples were collected continuously using split spoon samplers to the top of groundwater. Groundwater was encountered at approximately 27 feet in the GP-401 boring and approximately 8.5 feet in the GP-402 boring. Soil samples were logged in the field for moisture content, color, odor, and lithologic information, with the observations recorded on the attached boring and construction logs (Attachment 1).

Once the borings reached the target depth, the gas probes were constructed in accordance with the Modified WM Typical LFG Monitoring Probe (Attachment 2) through the hollow stem augers as the augers were withdrawn. Specifically, GP-401 was constructed with a screened interval extending from approximately 4 feet below grade to 24 feet below grade, and GP-402 was constructed with a screened interval from 3 feet below grade to 5.5 feet below grade. The gas probe casings were extended approximately 36 inches above grade using solid 2-inch ID PVC pipe. The screened intervals were constructed from 2-inch ID, 0.010-inch factory-slotted PVC casing fitted with a 2-inch threaded PVC end cap. After placing the screen, the annular space in each borehole surrounding the screened interval was filled with washed pea gravel to approximately 1 foot above the top of the screen. A 1-foot thick bentonite seal was placed above the filter pack.

Following placement of the bentonite seal, the remaining annular space was filled with a bentonite-cement grout, which extended above grade to a 3-foot square, 4-inch thick concrete pad centered on the gas probes. The gas probes were completed with a locking 4-inch diameter anodized aluminum protective casing set over the 2-inch ID PVC casing and into the 3-foot square concrete pad. The annular space within the base of the aluminum protective casings was filled with a 6-inch layer of dry bentonite pellets and a 1-foot thick layer of washed pea gravel. The casings were labeled and equipped



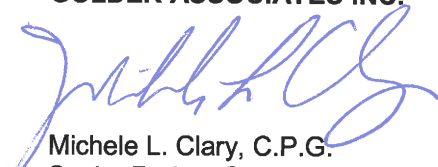
with a 2-inch PVC end cap and a 1/4-inch diameter quick-connect shut-off valve fitting for future monitoring.

Following completion of the gas probe construction activities, Flora Surveying was contacted by Waste Management to have GP-401 and GP-402 surveyed. A site map showing the locations of the newly installed probes is presented in Drawing 1.

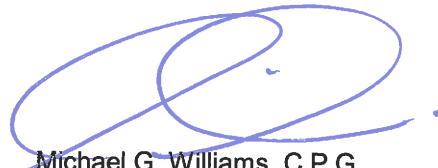
Closing

Should you have any questions, or require additional information, please contact the undersigned at (804) 358-7900.

Sincerely,
GOLDER ASSOCIATES INC.



Michele L. Clary, C.P.G.
Senior Project Geologist



Michael G. Williams, C.P.G.
Associate and Senior Hydrogeologist

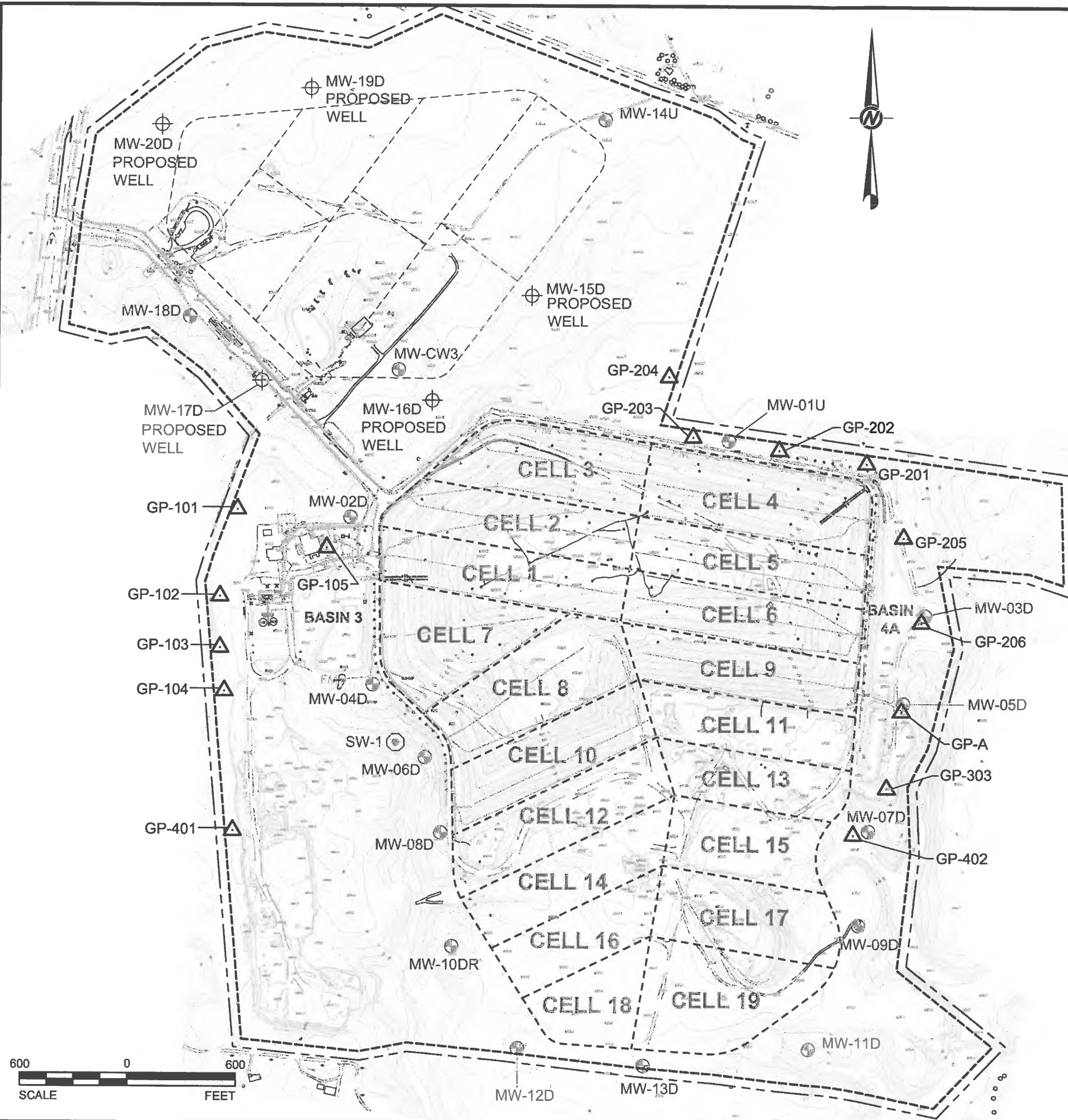
Attachments: Drawing 1 - Site Map
Attachment 1 - Boring and Construction Logs
Attachment 2 - Modified WM Typical LFG Monitoring Probe

\\rch1-s-fs1-vm\data\projects\waste management\middle peninsula lf\1339-6673 2013 gw compliance\gp install sept 2013\11-27-13 mid-pen gp install report.docx

DRAWING 1

SITE MAP

G:\Plan Production Data Files\Drawing Data Files\1339-6673D - Sept. 2013 GP Installation\Active Drawings\13396673D01.dwg 11x17



LEGEND:

	PROPERTY BOUNDARY
	FACILITY BOUNDARY
	CELL LIMITS
	EXISTING 10' TOPOGRAPHY CONTOUR (12-28-12)
	EXISTING 2' TOPOGRAPHY CONTOUR (12-28-12)
	MONITORING WELL LOCATION AND STATIC WATER ELEVATION (AMSL)
	GAS PROBE
	SURFACE WATER
	PROPOSED MONITORING WELL LOCATION

NOTES:

- TOPOGRAPHIC CONTOUR INTERVAL = 2 FEET.
- BASE MAP AND EXISTING TOPOGRAPHY COMPILED BY AEROMETRIC USING PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED 12/28/12.
- SITE DATUM: NAD 83 VA STATE PLANE SOUTH, VERTICAL DATUM BASED ON NGS MEAN SEA LEVEL.

PHASE TABLE

AREA	PHASE TABLE	
	PHASE	CELLS
AREA A	PHASE 1	CELLS 1, 2, 3
	PHASE 2	CELLS 4, 5, 6
	PHASE 3	CELLS 7, 8, 9
	PHASE 4	CELLS 10, 11
	PHASE 5	CELLS 12, 13
	PHASE 6	CELLS 14, 15
	PHASE 7	CELLS 16, 17
	PHASE 8	CELLS 18, 19
AREA B	PHASE 9	CELLS 20, 21
	PHASE 10	CELLS 22, 23
	PHASE 11	CELLS 24, 25, 26



WASTE MANAGEMENT
MIDDLE PENINSULA LANDFILL
GLOUCESTER COUNTY, VIRGINIA

PROJECT

SITE MAP

TITLE

PROJECT No. 1339-6673		
FILE No. 13396673D01		
REV. 0	SCALE AS SHOWN	
DESIGN	MLC	11/07/13
CADD	BPG	11/07/13
CHECK	MLC	11-7-13
REVIEW	MLC	11/27/13

DRAWING 1

ATTACHMENTS

Attachment 1 – Boring and Construction Logs

Attachment 2 - Modified WM Typical LFG Monitoring Probe

RECORD OF BOREHOLE GP-401

SHEET 1 of 1

PROJECT: WM-Middle Peninsula Landfill
PROJECT NUMBER: 1339-6673.510
DRILLED DEPTH: 30.00 ft
DRILL METHOD: 4.25-inch ID Hollow Stem Augers

DRILL RIG: CME 55
DATE STARTED: 9/23/13
DATE COMPLETED: 9/24/13

NORTHING: 3,716,589.88
EASTING: 12,026,376.15
GS ELEVATION: 96.32 ft
TOC ELEVATION: 100.07 ft

DEPTH W.L.: 26.92 ft
ELEVATION W.L.: 69.40 ft
DATE W.L.: 9/24/13
TIME W.L.: 12:50 pm

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE				SAMPLES					MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS / COMMENTS
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT		
0		0.00 - 1.50 (SM) SILTY SAND, fine to medium; pale yellow; poorly graded; non-cohesive, dry, compact.	SM			1	2 IN SS	6-10-10-7	20	1.67 2.00	<p>Bentonite Cement Grout</p> <p>Bentonite chips</p> <p>Pea Gravel</p> <p>Screened Interval</p> <p>Sand</p> <p>Soil cuttings</p>	WELL CASING Interval: 0-24' Material: PVC Diameter: 2" Joint Type: threaded WELL SCREEN Interval: 4-24' Material: PVC Diameter: 2" Slot Size: 0.010" End Cap: threaded PVC FILTER PACK Interval: 3-24' Type: Pea Gravel FILTER PACK SEAL Interval: 2-3' Type: Bentonite chips ANNULUS SEAL Interval: 0-2' Type: Bentonite Cement Grout WELL COMPLETION Pad: 3'x3' Square Concrete Protective Casing: 4" Round Anodized Aluminum DRILLING METHODS Type: 4.25-inch ID Hollow Stem Augers Notes:
95		1.50 - 5.00 (SM) SILTY SAND, fine to medium; red; poorly graded; non-cohesive, dry, compact.	SM		94.82 1.50	2	2 IN SS	12-12-12-14	24	1.00 2.00		
5		5.00 - 6.00 (SM) SILTY SAND, fine to medium; red; poorly graded; non-cohesive, dry, loose.	SM		91.32 5.00	3	2 IN SS	5-8-9-9	17	1.67 2.00		
90		6.00 - 8.00 (MH) sandy CLAYEY SILT, fine to medium; dark brown; poorly graded; non-cohesive, dry, loose.	MH		90.32 6.00	4	2 IN SS	9-9-10-8	19	1.33 2.00		
		8.00 - 10.50 (SM) SILTY SAND, fine to medium; yellow-red; poorly graded; non-cohesive, dry, loose.	SM		88.32 8.00	5	2 IN SS	2-3-3-4	6	1.67 2.00		
10		10.50 - 14.00 (SM) SILTY SAND, fine to medium; red-yellow; poorly graded; non-cohesive, dry, loose.	SM		85.82 10.50	6	2 IN SS	4-4-5-5	9	1.50 2.00		
85		14.00 - 17.00 (SM) SILTY SAND, fine to medium; yellow; poorly graded; non-cohesive, moist, loose.	SM		82.32 14.00	7	2 IN SS	2-2-3-4	5	1.42 2.00		
15		17.00 - 19.00 (SM) SILTY SAND, fine to medium; brown-yellow; poorly graded; non-cohesive, moist, loose.	SM		79.32 17.00	8	2 IN SS	3-4-6-6	10	1.83 2.00		
80		19.00 - 22.00 (CL) sandy CLAY; some medium sand; yellow-brown mottled light tan, orange-brown, red-brown; poorly graded; cohesive, W~PL.	CL		77.32 19.00	9	2 IN SS	7-8-12-8	20	1.83 2.00		
20		22.00 - 26.00 (SC) CLAYEY SAND, medium; trace non-plastic fines; yellow-red; poorly graded; non-cohesive, moist.	SC		74.32 22.00	10	2 IN SS	1-3-4-3	7	1.75 2.00		
75		26.00 - 28.00 (SM) SILTY SAND, fine to medium; yellow-red; poorly graded; non-cohesive, moist, loose.	SM		70.32 26.00	11	2 IN SS	4-3-4-5	7	1.33 2.00		
25		28.00 - 30.00 (SM) SILTY SAND, fine to medium; yellow-red; poorly graded; non-cohesive, wet, loose.	SM		68.32 28.00	12	2 IN SS	2-2-3-4	5	1.67 2.00		
70					66.32	13	2 IN SS	2-3-6-8	9	1.17 2.00		
30		Boring completed at 30.00 ft				14	2 IN SS	4-6-8-8	14	1.67 2.00		
						15	2 IN SS	1-1-1-1	2	1.83 2.00		

BOREHOLE RECORD BORING LOGS 9-13.GPJ ENV. BORING.GDT 11/26/13

LOG SCALE: 1 in = 3.75 ft

DRILLING COMPANY: Fishburne Drilling
DRILLER: Kevin/Ernest

PREPARED: C. Giordano
REVIEWED: M. Clary
DATE: 10/18/13



RECORD OF BOREHOLE GP-402

SHEET 1 of 1

PROJECT: WM-Middle Peninsula Landfill
PROJECT NUMBER: 1339-6673.510
DRILLED DEPTH: 12.00 ft
DRILL METHOD: 4.25-inch ID Hollow Stem Augers

DRILL RIG: CME 55
DATE STARTED: 9/24/13
DATE COMPLETED: 9/24/13

NORTHING: 3,716,574.88
EASTING: 12,029,845.10
GS ELEVATION: 57.28 ft
TOC ELEVATION: 60.49 ft

DEPTH W.L.: 8.30 ft
ELEVATION W.L.: 48.98 ft
DATE W.L.: 9/24/13
TIME W.L.: 2:32 pm

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE			SAMPLES					MONITORING WELL/ PIEZOMETER DIAGRAM AND NOTES	WELL CONSTRUCTION DETAILS / COMMENTS
		DESCRIPTION	USCS	GRAPHIC LOG ELEV. DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT		
0		0.00 - 2.00 (SM) SILTY SAND, medium; trace clay; yellow-red; dry, compact.	SM		1	2 IN SS	4-5-7-8	12	1.00 2.00	Bentonite Cement Grout	WELL CASING Interval: 0-5.5' Material: PVC Diameter: 2" Joint Type: threaded WELL SCREEN Interval: 3-5.5' Material: PVC Diameter: 2" Slot Size: 0.010" End Cap: threaded PVC FILTER PACK Interval: 2-6.5' Type: Pea Gravel FILTER PACK SEAL Interval: 1-2' Type: Bentonite chips ANNULUS SEAL Interval: 0-1' Type: Bentonite Cement Grout WELL COMPLETION Pad: 3'x3' Square Concrete Protective Casing: 4" Round Anodized Aluminum DRILLING METHODS Type: 4.25-inch ID Hollow Stem Augers Notes:
55		2.00 - 4.00 (SM) SILTY SAND, medium; some clay; yellow-red mottled gray; dry, compact.	SM	55.28 2.00	2	2 IN SS	7-7-8-6	15	1.50 2.00	Bentonite Pea Gravel	
		4.00 - 7.50 (SC) CLAYEY SAND, medium to coarse; poorly graded; dark brown; dry, loose.	SC	53.28 4.00	3	2 IN SS	4-4-5-8	9	1.33 2.00	Screened Interval Pea Gravel	
50		7.50 - 8.00 (CL) sandy CLAY; dark brown; W < PL, soft.	CL	49.78 7.50	4	2 IN SS	5-3-4-4	7	1.83 2.00		
		8.00 - 10.00 (CL) sandy CLAY; some gravel, well graded, coarse; dark brown; W < PL.	CL	49.28 8.00	5	2 IN SS	1-1-1-2	2	0.42 2.00	Soil Cuttings	
10		10.00 - 12.00 (GC) CLAYEY GRAVEL, well graded; white and gray; coarse; angular; wet.	GC	47.28 10.00	6	2 IN SS	1-1-1-3	2	1.00 2.00		
45		Boring completed at 12.00 ft		45.28							

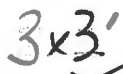
BOREHOLE RECORD BORING LOGS 9-13.GPJ ENV_BORING.GDT 11/26/13

LOG SCALE: 1 in = 1.88 ft
DRILLING COMPANY: Fishburne Drilling
DRILLER: Kevin/Ernest

PREPARED: C. Giordano
REVIEWED: M. Clary
DATE: 10/18/13



4" per WM Approval



1. FOR VADOSE ZONES GREATER THAN 25', CONSIDER TARGETING PREFERENTIAL MIGRATION ZONES.

HIGHEST SEASONAL
GROUNDWATER LEVEL
OR 8' BELOW BOTTOM
ELEVATION OF NEARBY
REFUSE, WHICHEVER IS
HIGHER.

TYPICAL LFG MONITORING PROBE
NO SCALE

PROBE COMPLETION DEPTH
BOREHOLE TOTAL DEPTH

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TYPICAL LFG MONITORING PROBE

Drawing No. **P-9**

Drawn by: Corp. CADD

Date: Oct. 2001

Detail:

P-9

EDGE SPEC



MIDDLE PENINSULA LANDFILL

3714 Waste Management Way
Glenns, Virginia 23149
(804) 693-5109

August 24, 2017

Commonwealth of Virginia
Department of Environmental Quality
4949-A Cox Road
Glen Allen, Virginia 23060

VIA Email: Jason.miller@deq.virginia.gov

Attn: Mr. Jason Miller
Land Protection and Revitalization Program Manager

**RE: INSTALLATION OF GAS BOUNDARY PROBES GP-106, GP-107
MIDDLE PENINSULA LANDFILL AND RECYCLING FACILITY, PERMIT NO. 572
GLENNS, VIRGINIA**

Dear Mr. Miller:

On behalf of the County of Gloucester (owner), Waste Management Disposal Services of Virginia, Inc. (operator) is submitting this letter documenting the installation of landfill gas boundary probes GP-106 and GP-107 at the Middle Peninsula Landfill and Recycling Facility, Permit No. 572. A summary of the construction activities is presented below.

Landfill Gas Probe Installation

Prior to mobilization, personnel from Golder Associates Inc. (Golder) contacted MISS Utility of Virginia to have the area surrounding the proposed drilling locations marked for public subsurface utilities. Following completion of the utility markings, gas probe installation and construction activities for GP-106 and GP-107 were completed on July 26, 2017. The installation activities were observed and recorded by a qualified geologist from Golder. A site map indicating the locations of GP-106 and GP-107 is presented as Drawing 1.

The drilling activities were performed by Ground Zero Environmental Field Services Inc., using a Geoprobe 7822DT drill rig. During advancement of the soil borings, soil samples were collected continuously to the groundwater table using a macrocore sampling device and acetate liners. The borehole was then overdrilled using 4.25-inch inner diameter (ID) hollow stem augers. Soil samples were logged in the field for moisture content, color, odor, and lithologic information, with the observations recorded on the attached boring and construction logs.

Once the borings reached the target depth, the gas probes were constructed in accordance with the Modified WM Typical LFG Monitoring Probe per the facility's Landfill Gas Management Plan through the hollow stem augers as the augers were withdrawn. Specifically, GP-107 was constructed with a screened interval extending from approximately 5 feet below grade to 15 feet below grade, and GP-106 was constructed with a screened interval from 5 feet below grade to 12 feet below grade. The gas probe casings were extended approximately 36 inches above grade using solid 2-inch ID PVC pipe. The screened intervals were constructed from 2-inch ID, flush-threaded, 3/16-inch field-perforated holes at 3-inch intervals and offset at 90 degrees in the PVC casing fitted with a 2-inch PVC end cap. After placing the screen, the annular space in each borehole surrounding the screened interval was filled with washed pea gravel to approximately 1 foot above the top of the screen. A 1-foot thick bentonite seal was placed above the filter pack.

Following placement of the bentonite seal, the remaining annular space was filled with a bentonite-cement grout, which extended above grade to a 2-foot square, 4-inch thick concrete pad centered on the gas probes. The gas probes were completed with a locking 4-inch diameter round steel protective casing set

Mr. Jason Miller
August 24, 2017
Page 2

over the 2-inch ID PVC casing and into the 2-foot square concrete pad. The annular space within the base of the protective casing was filled with a 6-inch layer of dry bentonite pellets and a 1-foot thick layer of washed pea gravel. The casing was labeled and equipped with a lock and 2-inch ID PVC end cap and a 1/4-inch diameter stainless steel quick-connect shut-off valve fitting for future monitoring.

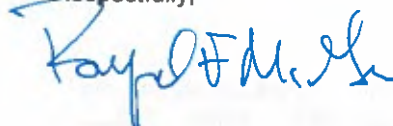
The completion depths of the gas probes are as follows:

Gas Probe IDs	Borehole Depths (feet below grade)	Screened Interval (feet below grade)
GP-106	13	5-12
GP-107	16	5-15

Following completion of the gas probe construction activities, Flora Surveying was contacted by Golder to have GP-106 and GP-107 surveyed. A site map showing the locations of the newly installed probes is presented in Drawing 1.

Waste Management is committed to conducting operations in a manner that protects the environment and our employees, neighbors and customers. We proactively work to implement programs to prevent pollution, while complying with legal requirements and ensuring compliance. Should you have any questions or require additional information regarding this submittal, please contact me at (804) 543-4782 or via e-mail at rmcgowan@wm.com.

Respectfully,



Raymond F. McGowan
Area Engineer

Attachments: Drawing 1 – Site Map
Boring and Construction Logs

cc: Vince Jamison, District Manager (e-copy), WM, vjamison@wm.com
Mike Caldwell, P.G. (e-copy), WM, mcaldwell@wm.com
Ron Owens (e-copy), County of Gloucester, rowens@gloucesterva.info
Lindy Harper (e-copy), County of Gloucester, bharper@gloucesterva.info
Eric Seavey, P.G. (e-copy), Piedmont Regional Office, DEQ, eric.seavey@deg.virginia.gov
Mike Williams, C.P.G. (e-copy), Golder Associates Inc., mike_williams@golder.com

GAS PROBE INSTALLATION OF GP-106

SHEET 1 of 1

PROJECT: Middle Peninsula Landfill
PROJECT NUMBER: 1339-667317
DATE STARTED: 7/26/17
DATE COMPLETED: 7/26/17

DRILLED DEPTH: 15.00 ft_
DRILL RIG: Geoprobe 7822DT
DRILL METHOD: 4.25-inch HSA and MacroCore GS

NORTHING: 3,718,139.16
EASTING: 12,026,313.55
GS ELEVATION: 92.82 ft

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE					GAS PROBE DIAGRAM and NOTES	GAS PROBE CONSTRUCTION DETAILS / COMMENTS
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	REC / ATT		
					DEPTH (ft)			
0		0.00 - 2.00 (ML) clayey SILT, brown grading to tan, tree roots, loose, dry.	ML					PROBE COMPLETION Pad: 2'x2' concrete Protective Casing: 4-inch round steel DRILLING METHODS Type: 4.25-inch HSA and MacroCore Notes: PROBE CASING Interval: 0-12' bgs Material: PVC Diameter: 2-inch Joint Type: threaded PROBE SCREEN Interval: 5-12' bgs Material: PVC Diameter: 2-inch Slot Size: 3/16-inch holes drilled every 3 inches End Cap: PVC FILTER PACK Interval: 4-13' bgs Type: pea gravel FILTER PACK SEAL Interval: 3-4' bgs Type: bentonite ANNULUS SEAL Interval: 0-3' bgs Type: cement grout
		2.00 - 4.00 (SC) clayey SAND, orange, very fine, moist.	SC		90.82 2.00	5.00 5.00		
		4.00 - 5.00 (CL) CLAY with very fine sand, orange and tan, stiff.	CL		88.82 4.00			
5		5.00 - 10.00 (CL) CLAY with very fine sand, white with orange mottles, very stiff to stiff.	CL		87.82 5.00			
		10.00 - 15.00 (SP) SAND, yellow grading to dark orange, loose, fine, moist.	SP		82.82 10.00			
		Wet at 15 feet below ground surface.						
15		Boring completed at 15.00 ft			77.82			

GAS PROBE (DETAILED 1 PROBE WELL) MID PENN GPS.GPJ ENVIRONMENTAL DATA TEMPLATE.GDT 8/14/17

LOG SCALE: 1 in = 2.63 ft

DRILLING COMPANY: Ground Zero
DRILLER: C. Gamwell

PREPARED: J. Church
REVIEWED: M. Clary
DATE: 8/14/17



SHEET 1 of 1

NORTHING: 3,718,585.42
EASTING: 12,026,510.84
e GS ELEVATION: 96.41 ft

GAS PROBE (DETAILED 1 PROBE WELL) MID PENN GPS.GPJ ENVIRONMENTAL DATA TEMPLATE.GDT 8/23/17



**Golder
Associates**

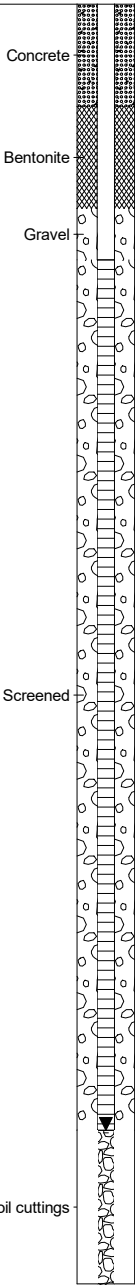
RECORD OF BOREHOLE GP-601

SHEET 1 of 1

PROJECT: Middle Peninsula Landfill
PROJECT NUMBER: 18-114256
DRILLED DEPTH: 22.00 ft
DRILL METHOD: 4.25 inch HSA and MacroCore

DRILL RIG: Geoprobe 7822DT
DATE STARTED: 7/10/19
DATE COMPLETED: 7/10/19

NORTHING: 3,716,065.08
EASTING: 12,026,423.48
GS ELEVATION: 88.77 ft

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE					MONITORING WELL/ PIEZOMETER DIAGRAM AND NOTES	WELL CONSTRUCTION DETAILS / COMMENTS	
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV.	ATT / REC			
					DEPTH (ft)				
0		0.00 - 1.50 (SM) SILTY SAND, fine to medium; light brown; poorly graded; non-cohesive, dry, loose.	SM						WELL CASING Interval: 0-22' Material: PVC Diameter: 2" Joint Type: threaded WELL COMPLETION Pad: 2'x2' Protective Casing: 4" ANNULUS SEAL Interval: 0-2' Type: concrete FILTER PACK SEAL Interval: 2-4' Type: Bentonite FILTER PACK Interval: 4-22' Type: All-purpose Gravel WELL SCREEN Interval: 5-22' Material: PVC Diameter: 2" Slot Size: 3/16" drilled End Cap: PVC DRILLING METHODS Type: 4.25 inch HSA and MacroCore
		1.50 - 5.00 (SM) SILTY SAND, fine to medium; reddish-orange; poorly graded; some organic debris and root material; non-cohesive, dry, compact.	SM		87.27	1.50	5.00 5.00		
5		5.00 - 7.25 (SM) SILTY SAND, fine to medium; reddish-orange; poorly graded; non-cohesive, dry, compact.	SM		83.77	5.00			

BOREHOLE RECORD 2019-07 GP-601 & GP-602.GPJ ENV BORING.GDT 08/01/19

LOG SCALE: 1 in = 3.75 ft DRILLING COMPANY: Ground Zero
DRILLER: C. Gamwell

PREPARED: C. Giordano
REVIEWED: T. Phillips
DATE: 7/31/19



RECORD OF BOREHOLE GP-602

SHEET 1 of 1

PROJECT: Middle Peninsula Landfill
PROJECT NUMBER: 18-114256
DRILLED DEPTH: 24.00 ft
DRILL METHOD: 4.25 inch HSA and MacroCore

DRILL RIG: Geoprobe 7822DT
DATE STARTED: 7/11/19
DATE COMPLETED: 7/11/19

NORTHING: 3,716,325.14
EASTING: 12,029,810.04
GS ELEVATION: 77.99 ft

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE				MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS / COMMENTS
		DESCRIPTION	USCS	GRAPHIC LOG	ELEV. DEPTH (ft)	ATT / REC	
0		0.00 - 6.00 (SM) SILTY SAND, medium; reddish-brown; well graded; non-cohesive, trace clay, trace subrounded gravel, some organic debris and root material, dry, loose.	SM				WELL CASING Interval: 0-24' Material: PVC Diameter: 2" Joint Type: threaded WELL COMPLETION Pad: concrete Protective Casing: 2'x2' ANNULUS SEAL Interval: 0-2' Type: concrete FILTER PACK SEAL Interval: 2-4' Type: Bentonite FILTER PACK Interval: 4-24' Type: All-purpose Gravel WELL SCREEN Interval: 5-24' Material: PVC Diameter: 2" Slot Size: 3/16" drilled End Cap: PVC DRILLING METHODS Type: 4.25 inch HSA and MacroCore
75					5.00	5.00	
5					71.99		
		6.00 - 6.50 (SM) SILTY SAND, fine; brown; well-graded; non-cohesive, some fine-medium gravel, trace wood debris, dry, loose.	SM		71.49		Concrete Bentonite Gravel Screened Interval Soil cuttings
70		6.50 - 10.00 (SM) SILTY SAND, medium; reddish-brown; well graded; non-cohesive, moist, loose.	SM		6.50	4.00	
					5.00	5.00	
10		10.00 - 11.00 (SM) SILTY SAND, medium; reddish-brown; well graded; non-cohesive, some wood debris, moist, very loose.	SM		67.99		
		11.00 - 17.00 (SC) CLAYEY SAND, medium to coarse; light orangish-brown; well graded; non-cohesive, moist, loose.	SC		10.00		
					66.99		
65					11.00	5.00	
					5.00	5.00	
15					60.99		
		17.00 - 18.00 (SM) SILTY SAND, medium; reddish-brown; well graded; non-cohesive, some wood debris, moist, very loose.	SM		17.00	5.00	
60		18.00 - 22.00 (SC) CLAYEY SAND, medium to coarse; orangish-brown; well graded; non-cohesive, some gray clay nodules, moist, loose.	SC		59.99	5.00	
					18.00		
20					55.99		
		22.00 - 23.00 (CL) sandy CLAY, dark reddish-brown; stiff, W<PL.	CL		22.00	5.00	
55		23.00 - 24.00 (GC) CLAYEY GRAVEL, medium; white, brown, and gray shells and shell fragments; sub-angular; well graded; non-cohesive, moist, compact.	GC		54.99	5.00	
		24.00 - 25.00 (GC) CLAYEY GRAVEL, medium; white, brown, and gray shells and shell fragments; sub-angular; well graded; non-cohesive, wet, compact.	GC		53.99		
25		25.00 - 27.00 (SC) CLAYEY SAND, medium to coarse; dark reddish-brown; well graded; non-cohesive, very moist, loose.	SC		24.00		
					52.99		
		27.00 - 30.00 (GC) CLAYEY GRAVEL, fine to medium; light gray and brown-gray; shells and shell fragments; sub-angular; well graded; non-cohesive, wet, compact.	GC		25.00	5.00	
50			GC		50.99	5.00	
					27.00	5.00	
30		Boring completed at 24.00 ft			47.99		
					30.00		

LOG SCALE: 1 in = 4 ft

DRILLING COMPANY: Ground Zero
DRILLER: C. Gamwell


PREPARED: C. Giordano
REVIEWED: T. Phillips
DATE: 7/31/19



BOREHOLE RECORD 2019-07 GP-601&GP-602.GPJ ENV BORING.GDT 08/01/19

APPENDIX B

WM LANDFILL GAS MIGRATION MONITORING STANDARD OPERATING PROCEDURE (SOP-LFG-1)

 SOP-LFG-1	Landfill Gas Migration Monitoring Standard Operating Procedure	Rev: 0 Date: 1/08/2013
<p>Application: Use this as the standard operating procedure (SOP) to obtain LFG migration monitoring readings from within the vadose zone in soil at established points. Monitoring points may also include structures in addition to permanent probes or bar hole probes at the perimeter of the facility (or other regulatory point).</p>		
<p>General Description: Federal Regulations 40 CFR 258.23 and State regulations promulgated under Subtitle D require solid waste disposal facilities to control lateral migration of gas (methane). WM LFG migration monitoring is to be performed using this standard procedure unless otherwise stipulated by site specific permit conditions or other state/provincial regulations or requirements.</p>		
<p><u>General Requirements:</u></p> <p>40 CFR 258.23 includes several key requirements:</p> <ul style="list-style-type: none"> • Minimum frequency of monitoring shall be quarterly, unless site-specific permits specify otherwise. <i>To prevent missed events, do not wait until the last month of the quarter to perform the monitoring.</i> • Take immediate steps to protect human health in the event methane levels in structures exceed 25% of the LEL (1.25% methane by volume). Immediately evacuate personnel within the structure and notify the site manager and MAGOM and implement contingency plans. It is required that the agency be notified of such an occurrence, by the appropriate WM personnel, within the mandated timeline (<i>Check site permit for mandated reporting requirements to the regulator.</i>). • The limit for methane detection at the property boundary is 100% of the LEL (5% methane by volume). Notify the appropriate site management, EP and MAGOM immediately when levels meet or exceed this value. It is a requirement that the agency be also be notified of such an occurrence, by the appropriate WM personnel, within the mandated timeline. • WM approved LFG monitoring instruments are the CES-LANDTEC GEM-2000 and GEM-5000 or WM approved alternative. Alternative instruments must be approved in writing by the appropriate Corporate GOM. • All migration monitoring data, regardless of purpose, shall be uploaded to LGMS in accordance with the Landfill Gas Management System (LGMS) and Data Collection Policy. <p>The following parameters shall be monitored and uploaded to LGMS whenever migration monitoring occurs:</p> <ul style="list-style-type: none"> • Identification of person taking the reading • Identification of person uploading the readings to the LGMS 		

FILE 5.5

- Date and Time of Reading
- Barometric Pressure (1 Time/Reading Day)
- Ambient Temperature (1 Time/Reading Day)
- Precipitation (1 Time/Reading Day)
- Wind Direction (1 Time/Reading Day)
- Instrument Identification
- All other monitored parameters
- Appropriate Comments

Up to five questions can be pre-programmed into the GEM instrument to allow for monitoring for VOCs, H₂S, water levels, etc. as required by permit.

Appropriate comments shall be included with each reading. Typical comments include, but are not limited to, signs of vegetation damage or stress, ground cover and soil conditions (e.g. snow, frozen ground, saturated soil, etc.), audible or visual indications of gas venting (especially in standing water), and the presence of water and level within the probe where required.

As a means to prevent missed readings and to promote an efficient field event, it is important to properly sequence the monitoring order of points within LGMS (prior to the monitoring event).

Probe Monitoring:

Note: Each probe must have a proper sampling port installed to allow readings for methane without air intrusion (see Typical LFG Monitoring Probe Drawing No. P-9 of the GCCS Design & Installation Guidance Manual and associated detail included herewith). If it is required (by permit or regulation) to determine the pressure at the probe, the probe must have a petcock type ball valve or quick connect coupling be installed on the cap. Grainger Item No. 3CGK1 and 3CGP5 are recommended if clearance tolerances allow within the protective casing. The Landtec quick coupling-Female (Part No. 3-00000-1201) with vinyl cap (Part No. 3-00000-0215) is allowed if preferred. If the water level is required, it shall be measured after all other measurements are taken. Bubbler tubes such as those provided in the attached detail are the preferred system for measuring water levels due to ease and accuracy. The QED Digital Level Meter (cut sheet attached) is the preferred device for use with the bubbler tubing to depths of 80 feet. Refer to the attached table for state specific water level monitoring requirements.

1. All migration monitoring probes shall be designated as "Probes" within LGMS.
2. Upload relevant site probe IDs to the GEM in GA mode prior to departure to the field.
3. Calibrate the GEM (or other approved instrument) in accordance with manufacturer's recommendations. For GEM devices, use 15% methane calibration gas as this provides increased low range accuracy. For other approved instruments, the calibration gas concentration shall be approximately 10 – 20% methane unless the manufacturer's recommendations state otherwise.
4. After calibration is complete, document calibration zero and span accuracy by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Configure specific "Sample Port" IDs in LGMS for this purpose. Suggested ID names are FRESHAIR for air and CAL15CH4 for 15% methane calibration gas.

5. Set the GEM to Gas Analyzer (GA mode) for all probe measurements. This mode measures and stores the relative pressure within the probe prior to starting the sampling so an accurate pressure measurement is obtained. Do not use the GEM mode when measuring probes. A water trap and new (each day) carbon filter are required to protect instrumentation from damage and to remove trace compounds such as ethane that can cause inaccurately high methane measurements.
6. Inspect the probe and area around the probe for hazards or issues such as broken or worn components, damage, safety hazards, or signs of subsurface LFG migration. Include any issues in the reading comments.
7. Connect the sample hose (with carbon filter and water trap) to the instrument. Purge the instrument and sample hose with fresh air and select the appropriate probe ID.
8. Connect the sample hose to the probe sample point and ensure the hose is securely attached to the fitting. **Do not connect the sample hose to the sampling point of the probe before connecting to the instrument as this could release pressure and LFG from the probe and prevent proper monitoring.**
9. Open the petcock valve on the sample point. As soon as the valve is opened, the relative/static pressure reading will be displayed on the instrument. Allow 5-10 seconds for the pressure to stabilize before starting the sample pump. The instrument (in GA mode) automatically stores the relative pressure before starting the sample pump. **The relative pressure reading will not change while the sample is taken.** When the pressure is stabilized, start the pump.
10. Observe the methane values visible on the GEM (if any) and allow readings to stabilize. It will usually take about 30 to 45 seconds for the sample to reach the instrument and for the instrument to respond. It is important to note the methane values initially measured by the GEM sensors will often spike before accurate and stable readings are displayed. **A stable reading does not vary more than 0.5 percent by volume on the meter's scale.** A stable reading should occur within 90 seconds.

Note: The US EPA and many states stipulate that purging the probe is not necessary due to the small volume of the probe and, because methane is lighter than air, it collects in the head space of the probe. However, some states and other regulatory jurisdictions require purging. The standard WM procedure is not to purge the probe unless stipulated by regulation, permit, or other similar requirement because this simulates LFG buildup within a closed space and is therefore a more conservative approach. Refer to the attached table for state specific purging requirements.

11. If required, measure the water level within the probe and record the value using a pre-programmed question in the GEM. Use caution to prevent any cross-contamination between probes from contaminated water level detection devices. Bubbler tube use is recommended as noted above.
12. Some states require the instrument calibration to be verified at the end of the day to help ensure accurate readings. If required, document calibration zero and span accuracy at the end of the day by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Use the same "Sample Port" IDs as for the original calibration documentation. Refer to the attached table for state specific

requirements regarding end of day calibration checks.

13. Review the data and upload it to LGMS at the end of the monitoring event or each day if multiple days are required. If methane concentrations of 5% by volume (100% of the LEL) or greater were measured, promptly notify site management, EP and the MAGOM.
14. DO NOT resume monitoring of LFG wells until another calibration of the device is performed using 50% methane.

Structure Monitoring:

BMP-LFG-104 clarifies when fixed Building Monitors should be incorporated within site structures. Sufficient building monitors may preclude the need for additional monitoring with the GEM (or other approved instrument). Building Monitor calibration checks are required per manufacturer's recommendations. Records documenting Building Monitor calibration and any detections of methane are to be maintained and uploaded to the "Documents" page within LGMS no less frequently than quarterly.

Where required (and when Building Monitors are not in place), methane gas accumulation shall be monitored within areas where LFG is likely to enter and collect within the structure such as confined areas, corners, crawl spaces, attics, underground utility runs, sumps, and underground utility penetrations.

1. LGMS IDs shall be established for each monitoring location within each structure to enable proper documentation within LGMS and to prevent missed readings.
2. All monitoring locations shall be designated as "Sample Ports" within LGMS.
3. Sequence the monitoring locations order within LGMS to aid in the field and as a means to prevent missed points.
4. Upload relevant site IDs to the GEM in GA mode prior to departure to the field.
5. When monitoring combustible gas in buildings or structures, use the rigid probe attachment to the GEM as appropriate to allow easy access to narrow spaces.
6. Calibrate the GEM (or other approved instrument) in accordance with manufacturer's recommendations. For GEM devices, use 15% methane calibration gas as this provides increased low range accuracy. For other approved instruments, the calibration gas concentration shall be approximately 10 – 20% methane unless the manufacturer's recommendations state otherwise.
7. After calibration is complete, document calibration zero and span accuracy by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Configure specific "Sample Port" IDs in LGMS for this purpose. Suggested ID names are FRESHAIR for air and CAL15CH4 for 15% methane calibration gas.
8. Set the GEM instrument to GA mode. A water trap and new (each day) carbon filter are required to protect instrumentation from damage and to remove trace compounds such as ethane that can cause inaccurately high methane measurements.
9. Initiate monitoring and observe the methane values on the GEM (if any). Allow enough time for readings to stabilize at each monitoring point. It will usually take about 30 to 45 seconds for the sample to reach the instrument and for the instrument to respond. It is important to note that the methane values initially measured by the GEM sensors will often spike before accurate and stable readings are displayed. **A stable reading does not vary more than 0.5 percent by volume on the meter's scale.** When actually sampling a crack or joint in a structure or performing a "floor scan", stop and let the device process the sample prior to moving to the next sampling

location. A stable reading should occur within 90 seconds.

10. Take immediate steps to protect personnel if methane levels exceeding 25% of the LEL (1.25% methane by volume) are detected. Immediately evacuate all personnel from within the structure. Do not turn any lights or other electrical equipment on or off or use the telephone. After the building has been evacuated and you are outside, use your cell phone or a telephone within another structure to immediately notify the site manager, EP and MA GOM.
11. Review the data and upload it to LGMS at the end of the monitoring event or each day if multiple days are required. Provide any required notifications to site management, EP and the MAGOM.
12. DO NOT resume monitoring of wells until another calibration of the device is performed using 50% methane.

Bar Hole Monitoring:

Note: Bar hole probing is performed using a plunger bar to drive a small diameter hole to a depth of about 3 feet into the ground. **Use caution to ensure areas to be monitored have no underground utilities or other hazards prior to performing the work.** Bar hole punching requires soils conducive to this technique such as sands, sandy loams and some silty soils without high amounts of clay or rock. Bar hole probe readings are typically performed near structures or along the perimeter of a landfill to determine whether landfill gas is migrating off site. It may also be useful to confirm landfill gas migration in areas with stressed vegetation, as "burned out" areas may be indications of landfill gas migration near the surface.

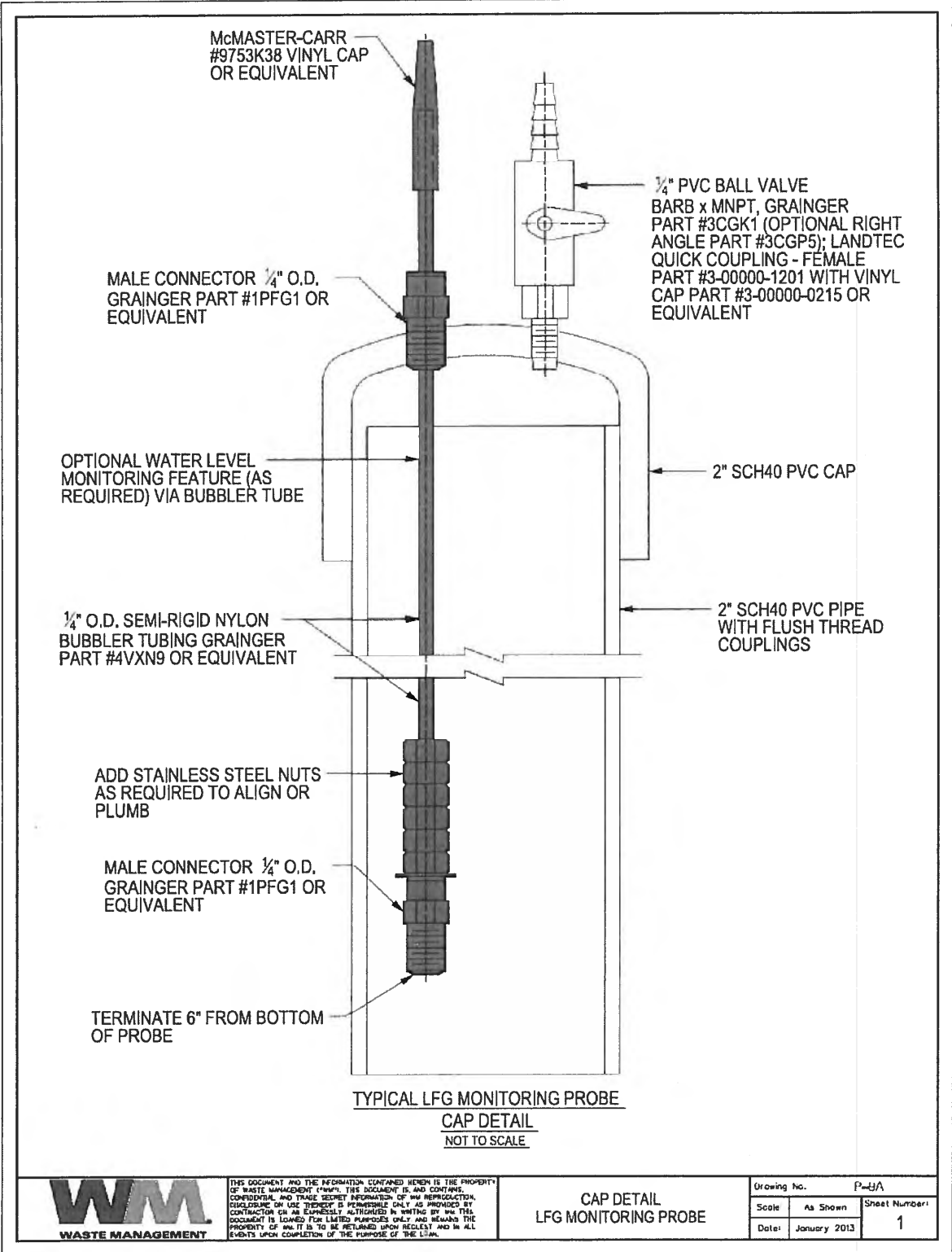
1. Create the bar hole at the desired location using a commercially available (from companies such as Forestry Suppliers, Inc.) "slide", "punch", "slam" or "drive" bar (such as the Geoprobe Manual Slide Hammer) or fence post driver (Grainger Part No. 4LVN8) with a ½ inch diameter rod or using the GASTEC Model No. 361 boring rod (33.5 inches long). If this location is to be monitored more than once, it may prove helpful to insert a nominal ½ inch diameter plastic PVC pipe (cut 12-18 inches in length) into the hole. The pipe will readily accept a compression type, expanding, rubber stopper to provide an air tight seal at the top.
2. Follow Probe Monitoring steps 1-8 listed above. However, to sample the hole for the presence of methane, remove the plunger bar and immediately insert the sample probe for the GEM (or other approved instrument). Seal the surface around the sample probe to minimize air infiltration into the bar hole using an appropriately sized rubber stopper with a sample probe inserted through the center of the rubber stopper. Once sealed, immediately start the sampling.
3. Start the instrument sample pump and observe the methane values visible on the GEM (if any) and allow readings to stabilize. **Note: Use caution with respect to liquids entering the tubing as the GEM will be seriously damaged if liquid enters the instrument.**
4. It will usually take about 30 to 45 seconds for the sample to reach the instrument and for the instrument to respond. It is important to note that the methane values initially measured by the GEM sensors will often spike before accurate and stable readings are displayed. **A stable reading does not vary more than 0.5 percent by volume on the meter's scale.** A stable reading should occur within 90 seconds. Some states require the instrument calibration to be verified at the end of the day to help ensure accurate readings. If required, document calibration zero and span accuracy

at the end of the day by taking a reading using the calibration gas and fresh air and uploading these readings to LGMS. Use the same "Sample Port" IDs as for the original calibration documentation. Refer to the attached table for state specific requirements regarding end of day calibration checks

5. Review the data and upload it to LGMS at the end of the monitoring event or each day if multiple days are required. If methane concentrations of 5% by volume (100% of the LEL) or greater were measured, promptly notify site management, EP and the MAGOM.
6. DO NOT resume monitoring of LFG wells until another calibration of the device is performed using 50% methane.

Reference/Links:

- **Landfill Gas Management System (LGMS) and Data Collection Policy**
- **BMP-LFG-104 Building Monitors**
- **Site Specific LFG Migration Monitoring Plans**



Cap Detail_LFG Monitoring Probe.dgn 1/3/2013 3:25:09 PM

EASY LEVEL

Liquid Level Measurement for Landfill Gas Wells with Digital Level Meter

Safe and easy measurement of liquid height in landfill gas wells, even under vacuum or pressure conditions.

The Digital Level Meter allows you to easily and accurately measure liquid levels in gas wells equipped with an Easy Level Indicator or a down-well bubbler tube. There is no need to open the well to take a reading, so gas collection is not stopped and workers are not exposed to gas or leachate.

The Digital Level Meter is capable of measuring liquid depths up to 100 ft. above the liquid level probe, and automatically compensates for pressure or vacuum conditions above the liquid. The light-weight hip pack also houses a small compressor powered by a rechargeable, removable battery. A spare battery and AC battery charger are provided. The entire unit weighs only 9lbs. and includes an adjustable shoulder strap.

To measure the liquid level, the Digital Level Meter's quick connect fittings are attached to the ports of an Easy Level Indicator or a dedicated bubbler tube, and the meter's air source is then activated. The level meter displays the liquid depth over the probe, without false readings in foaming wells.

Digital Level Meter Advantages:

- Compact and light-weight
- Rechargeable batteries
- No air enters the well
- Gas collection is not interrupted
- No false readings in foaming wells
- Easily transported from well to well
- Personnel are not exposed to landfill gases or leachate
- Accuracy is not affected by vacuum or pressure in the well



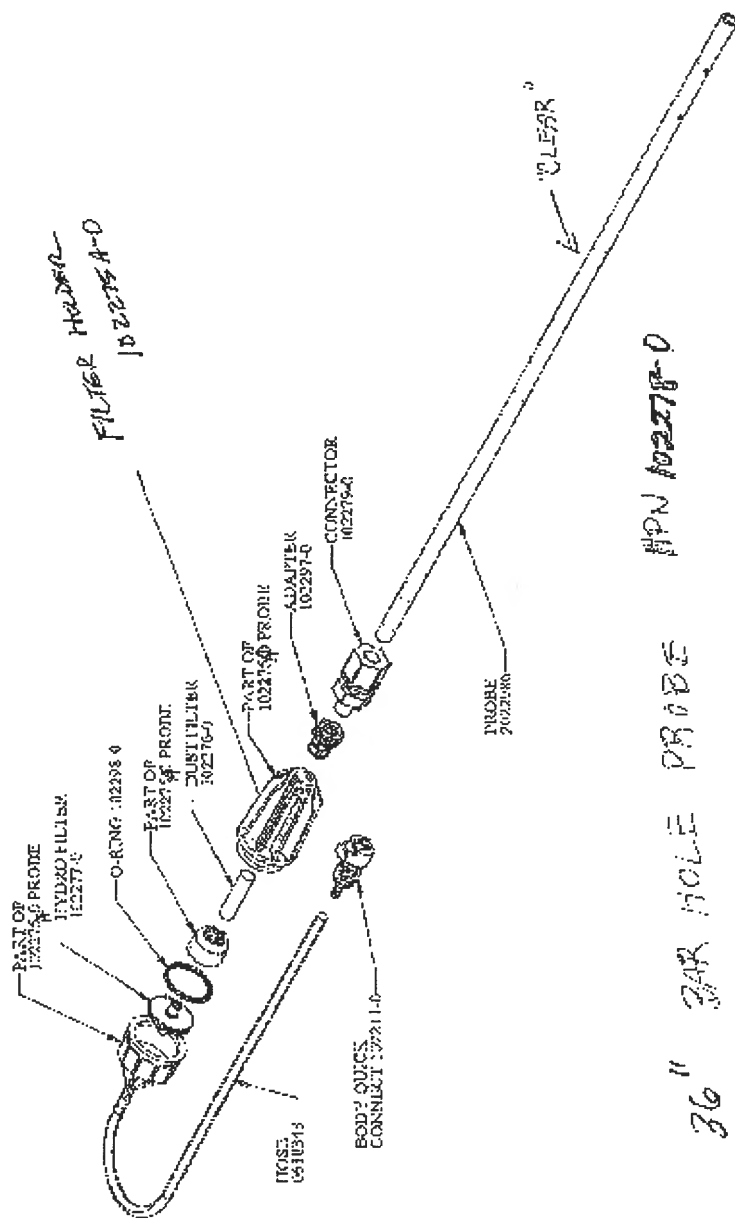
P.O. Box 3726 Ann Arbor, MI 48106-3726 USA • Phone (800) 624-2026 • Fax (734) 995-1170
info@qedenv.com • www.qedenv.com

Federal Regulations For Explosive Gas Monitoring

§ 258.23 Explosive gases control.

- (a) Owners or operators of all MSWLF units must ensure that:
 - 1) The concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit for methane in facility structures (excluding gas control or recovery system components); and
 - 2) The concentration of methane gas does not exceed the lower explosive limit for methane at the facility property boundary.
- (b) Owners or operators of all MSWLF units must implement a routine methane monitoring program to ensure that the standards of paragraph (a) of this section are met.
 - 1) The type and frequency of monitoring must be determined based on the following factors:
 - i. Soil conditions;
 - ii. The hydrogeologic conditions surrounding the facility;
 - iii. The hydraulic conditions surrounding the facility; and
 - iv. The location of facility structures and property boundaries.
 - 2) The minimum frequency of monitoring shall be quarterly.
- (c) If methane gas levels exceeding the limits specified in paragraph (a) of this section are detected, the owner or operator must:
 - 1) Immediately take all necessary steps to ensure protection of human health and notify the State Director;
 - 2) Within seven days of detection, place in the operating record the methane gas levels detected and a description of the steps taken to protect human health; and
 - 3) Within 60 days of detection, implement a remediation plan for the methane gas releases, place a copy of the plan in the operating record, and notify the State Director that the plan has been implemented. The plan shall describe the nature and extent of the problem and the proposed remedy.
 - 4) The Director of an approved State may establish alternative schedules for demonstrating compliance with paragraphs (c) (2) and (3) of this section.
- (d) For purposes of this section, *lower explosive limit* means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25° C and atmospheric pressure.
- (e) The Director of an approved State may establish alternative frequencies for the monitoring requirement of paragraph (b)(2) of this section, after public review and comment, for any owners or operators of MSWLFs that dispose of 20 tons of municipal solid waste per day or less, based on an annual average. Any alternative monitoring frequencies established under this paragraph must:
 - 1) Consider the unique characteristics of small communities;
 - 2) Take into account climatic and hydrogeologic conditions; and
 - 3) Be protective of human health and the environment.

[56 FR 51016, Oct. 9, 1991, as amended at 62 FR 40713, July 29, 1997]



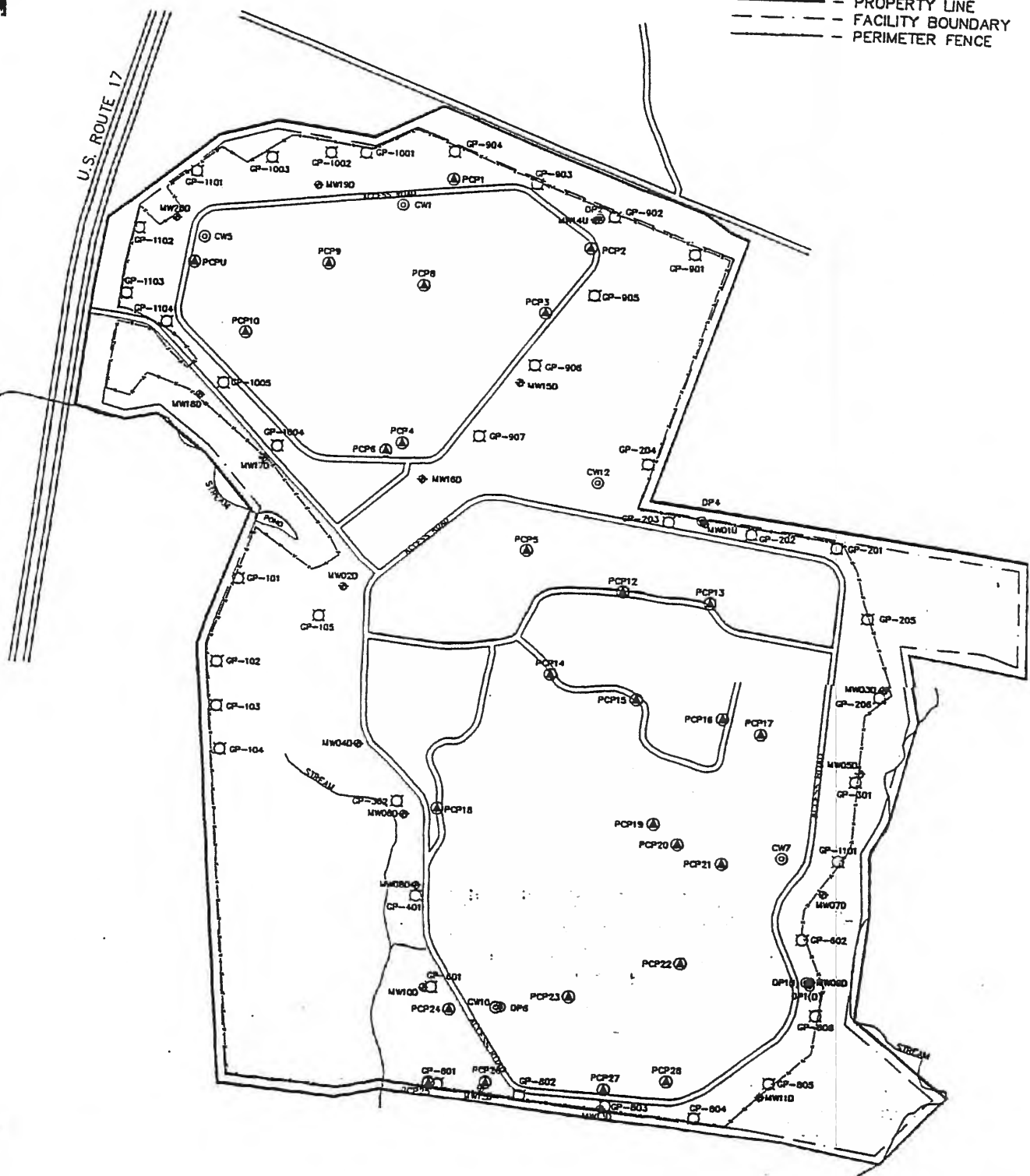
State or Province Specific LFG Migration Monitoring Requirements (current on 11/1/12)

State or Province	Regs?	Guidance	Purge	Water Levels?	End of Day Calibration Check?	Notes:
AL	YES	NO	NO	NO	NO	
AK	NO	NO	NO	NO	NO	
AZ	YES	NO	NO	NO	NO	
AR	YES	NO	NO	NO	NO	State regulation 22 Section 22.415
CA	YES	YES	YES	NO	NO	Consult site specific permits for purge and sampling details
CO	YES	NO	NO	YES	NO	
CT	YES	NO	NO	NO	NO	
DE	YES	NO	NO	NO	NO	Required quarterly by permit.
FL	YES	NO	NO	NO	NO	62-701.530 - Sampling shall be conducted in the headspace of the monitoring probe without purging the gas before collecting the sample.
GA	YES	YES	NO	NO	NO	Sampling must be conducted under normal /average conditions of temperature pressure and climate for the season. In addition all sampling must be performed after 12:00 pm and the readings submitted on the state form SWM-19. To sample the well, the cap is removed and the GEM 2000 hose is attached to the sample port and the percent methane and oxygen is recorded.
HI	Yes	NO	NO	NO	NO	
ID	X	X	X	X	X	No landfills
IL	NO *	NO	NO	NO	NO	* Only the monitoring frequency
IN	NO	YES	NO	YES	NO	Water level (if applicable).
IA	NO	NO	NO	NO	NO	
KS	NO	NO	NO	NO	NO	
KY	NO	YES	NO	NO	NO	The explosive meter should read "percent lower explosive limit" and should have a flexible probe capable of being placed in subsurface holes made by the bar hole punch. For surface testing this method consists of placing the probe in areas in and around the landfill vicinity and simply drawing a sufficient amount of air to obtain a reading.
LA	YES	NO	NO	NO	NO	
ME	YES	NO	NO	NO	NO	Regulations: 06-096
MD	NO	NO	NO	NO	NO	
MA	NO	YES	YES	NO	NO	Sample prior to purging then after. Purge two well volumes. Provide hourly barometric pressure readings for the day of sampling 12-hours before and for the entire event.
MI	NO	NO	NO	NO	NO	
MN	NO	NO	NO	NO	NO	Elk River CUP/License agreement with City says we will take daily barometric pressure and temperature readings for 3 days prior to sampling and the day of sampling. Use site weather station data. Also want pressure reading if methane present in probe.
MS	YES	NO	NO	NO	NO	
MO	NO	YES	NO	NO	NO	Record stabilized reading. (One that does not vary over 0.5 percent.)
MT	X	X	X	X	X	No landfills

State or Province	Regs?	Guidance	Purge	Water Levels?	End of Day Recalibration?	Notes:
NE	NO	YES	NO	NO	YES	Record stabilized reading. (One that does not vary over 0.5 percent.)
NV	X	X	X	X	X	No landfills
NH	YES	NO	NO	NO	NO	Env-Sw 806.07
NJ	YES	NO	NO	NO	NO	Required quarterly by permit.
NM	YES	YES	YES	YES	NO	
NY	NO	NO	NO	NO	NO	
NC	NO	YES	YES	NO	NO	Stopcock valve required. Purge for at least one minute
ND	NO	NO	NO	NO	NO	
OH	YES	NO	YES	NO	NO	Ohio guidance is to follow the procedures outlined in each sites specific Landfill Gas Monitoring Plan.
OK	YES	NO	YES	YES	NO	
OR	YES	NO	NO	NO	NO	
PA	YES	NO	NO	NO	NO	Required quarterly by permit.
RI	X	X	X	X	X	No landfills
SC	YES	NO	NO	YES	NO	Record stabilized reading. (Not defined)
SD	X	X	X	X	X	No landfills
TN	YES	NO	NO	NO	NO	1200-01-07-.04(5)(a)5 Must be sampled quarterly and the following information recorded: (I) the date, exact place, and time of sampling or measurements; (II) The individual(s) who performed the sampling or measurements; (III) The date(s) analyses were performed; (IV) The individual(s) who performed the analyses; (V) The analytical techniques or methods used (including equipment used); and (VI) The results of such analyses. There are no regulations/guidance on how to properly sample the probes. All sampling for landfill gas requires insturment calibration with methane cal gas. You must record calibration activities (i.e. instrument, cal gas lot number, etc.)
TX	YES	YES	NO	YES	NO	30 TAC 330.731 for Regs. & TCEQ website for guidance
UT	YES	NO	NO	NO	NO	
VT	X	X	X	X	X	No landfills
VA	NO	NO	NO	NO	NO	
WA	YES	NO	NO	NO	NO	
WV	NO	NO	NO	NO	NO	
WI	YES	NO	NO	NO	NO	NR 507.22 - Initial and stabilized methane levels to be recorded unless the stabilized reading drops to zero.
WY	X	X	X	X	X	No landfills
Canada:						
Ontario	YES	NO	NO	NO	NO	Per Env. Monitoring Plan
Quebec	YES	NO	NO	NO	NO	
ALB	YES	NO	NO	NO	NO	Per Env. Monitoring Plan, lower explosive limits than US
BC						No landfills
MAN						No landfills
SAS						No landfills

LEGEND

- GP-902 □ - GAS PROBE
- CW12 ⊙ - CHARACTERIZATION WELL
- DP2 ⊙ - PIEZOMETER NEST
- MW120 ⊕ - MONITORING WELLS
- PCP2 ⊕ - PIEZOCONE
- - PROPERTY LINE
- - - - - FACILITY BOUNDARY
- - - - - PERIMETER FENCE



NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
 3450 Schuylkill Road
 Spring City, PA 19475-1124

**MIDDLE PENINSULA LANDFILL
 AND RECYCLING FACILITY**

DRAWN BY:	SGS	DATE:	12-08-95	FIGURE 1
CHECKED BY:		DETAIL NO.:	15200003	
JOB NO.:	15200.099	SCALE:	1"=900'	

APPENDIX C
SAMPLE BOUNDARY PROBE MONITORING LOG

Middle Peninsula Landfill Gas Probe Monitoring Log				
Weather Conditions				
Wind Speed and Direction				
Atmospheric Temperature				
Equipment Used				
Equipment Calibration Date				
Sampling Technician				
Sampling Method		Instantaneous and steady-state readings observed		
Calibration Gas Used		LandTec 15% CH4 and 15% CO2 Mix and 11% O2		
Calibration Results				
GEM ID	Date & Time	CH4 (%)	CO2 (%)	O2 (%)
GEMCALIB				
GEMCALIB				
Sample Location	Date & Time	CH4 (%)	Relative Pressure ("H2O)	Barometric Pressure ("HG)
MPGP0101				
MPGP0102				
MPGP0103				
MPGP0104				
MPGP0105				
MPGP0106				
MPGP0107				
MPGP0201				
MPGP0202				
MPGP0203				
MPGP0204				
MPGP0205				
MPGP0206				
MPGP0301				
MPGP0302				
MPGP0303				
MPGP0401				
MPGP0402				
MPGP0601				
MPGP0602				
MPGPBARN (Pole Barn)				
MPGPCOMP (Compressor Bld)				
MPGPGASP (Gas Plant)				
MPGPMAIN (Mian Office)				
MPGPODOR (Deodorizer Bld)				
MPGPSCAL (Scalehouse)				
MPGPISH01 (Sump House 1)				
MPGPISH02 (Sump House 2)				

MPGPSH03 (Sump House 3)				
MPGPSH04 (Sump House 4)				
MPGPSH05 (Sump House 5)				
MPGPSH06 (Sump House 6)				
MPGPSH07 (Sump House 7)				
MPGPSH08 (Sump House 8)				
MPGPSH09 (Sump House 9)				
MPGPSH10 (Sump House 10)				
MPGPSH11 (Sump House 11)				
MPGPSH13 (Sump House 13)				
MPGPSH15 (Sump House 15)				
MPGPSHOP (Maintenance Bld)				

APPENDIX D

**UPDATED GAS COLLECTION AND CONTROL SYSTEM DESIGN PLAN
AND TITLE V AIR PERMIT**

July 30, 2021
File No. 02221018.00

Mr. David Robinett
Air Compliance Manager
Virginia Department of Environmental Quality
Piedmont Regional Office
4949-A Cox Road
Glen Allen, Virginia 23060
David.Robinett@DEQ.Virginia.gov

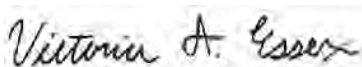
Subject: Updated Gas Collection and Control System (GCCS) Design Plan
Middle Peninsula Landfill and Recycling Facility – Title V Permit No. PRO-40920

Dear Mr. Robinett,

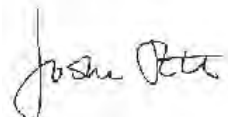
On behalf of Waste Management Disposal Services of Virginia, Inc., SCS Engineers (SCS) submits the attached updated gas collection and control system (GCCS) design plan (plan) for the Middle Peninsula Landfill and Recycling Facility, as requested by Sherry Tostenson of VDEQ on February 24, 2021 via email. This plan has been updated pursuant to 9 VAC 5-40 Article 43.1, which implements the Emission Guidelines (EG) for Municipal Solid Waste (MSW) Landfills of 40 CFR 60 Subpart Cf, and 40 CFR 63 Subpart AAAA.

If you have any questions or comments on the attached plan, please contact either of the undersigned or Mr. James Hackney of the Middle Peninsula Landfill and Recycling Facility at jhackney@wm.com.

Sincerely,



Victoria Essex, EIT
Project Professional
SCS Engineers
vessex@scsengineers.com



Joshua Roth, P.E.
Vice President
SCS Engineers
jroth@scsengineers.com

CC: James Hackney – Middle Peninsula Landfill and Recycling Facility

Attachment



**MIDDLE PENINSULA LANDFILL AND
RECYCLING FACILITY
3714 WASTE MANAGEMENT WAY
GLENN, VIRGINIA 23149**

**LANDFILL GAS COLLECTION AND CONTROL SYSTEM
DESIGN PLAN**



Prepared for

WASTE MANAGEMENT DISPOSAL SERVICES OF VIRGINIA, INC.

July 2021

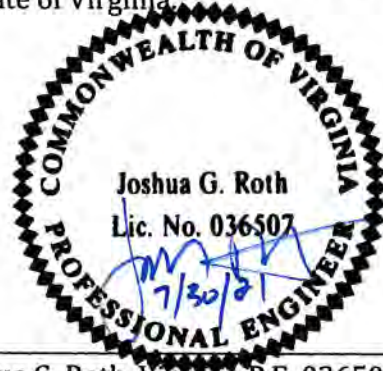
Prepared by

SCS ENGINEERS
11260 Roger Bacon Drive
Reston, Virginia 20190-5282
(703) 471-6150

Signature and P.E. Certification

This GCCS Design Plan for the Middle Peninsula Landfill and Recycling Facility has been prepared by SCS Engineers as authorized by Middle Peninsula Landfill and Recycling Facility.

I certify that the GCCS as described in this Plan meets the design requirements specified in 40 CFR §60.40f and 40 CFR §63.1962 and any alternatives pursuant to 40 CFR §60.38f(d)(2) and 40 CFR §63.1981(d)(2). I further certify that this report was prepared by me or under my direct supervision, and that I am a duly registered Professional Engineer under the laws of the State of Virginia.



Joshua G. Roth, Virginia P.E. 036507

Design Plan Implementation Schedule for GCCS Operations

The site will initiate GCCS operation, including associated monitoring, recordkeeping and reporting in accordance with EG Cf and NESHAP AAAA on September 27, 2021.

If VDEQ requires the facility to modify this plan, the modification applies prospectively, not retroactively to the landfill. Changes to the plan requested by VDEQ that affect GCCS operations or monitoring or recordkeeping do not take effect until VDEQ approves the requested plan modifications.



Michael Easter
Area Engineer
Middle Peninsula Landfill and Recycling Facility

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1 INTRODUCTION

1.1 Purpose

This Landfill Gas Collection and Control System (GCCS) design plan (Plan) for the Middle Peninsula Landfill and Recycling Facility has been prepared in accordance with the requirements of Title 40 of the Code of Federal Regulations (CFR) Part 60, Subpart Cf (“Emission Guidelines [EG]and Compliance Times for Municipal Solid Waste Landfills”) and 40 CFR Part 63, Subpart AAAAA (“National Air Emissions Standards for Hazardous Air Pollutants [NESHAP]: Municipal Solid Waste Landfills”).

9 VAC5-40 Article 43.1 (Article 43.1) – Emission Standards for Municipal Solid Waste Landfills – which adopts the requirements of 40 CFR Part 60 Subpart Cf (EG Cf) was approved by the United States Environmental Protection Agency (EPA) on June 23 , 2020 and became effective on July 23, 2020. The NESHAP Subpart AAAAA was revised and promulgated on March 26, 2020 and applies to all landfills with NMOC emissions greater than 50 Mg/year. On February 24, 2021, the VDEQ requested that landfills subject to these requirements submit a GCCS Design Plan no later than July 31, 2021.

The purpose of this document is to provide a design plan that meets the requirements of both EG Cf and NESHAP AAAAA and to provide the VDEQ the design standards and calculations used to prepare this GCCS Design Plan. This plan also documents approved and/or proposed alternatives to the default operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping or reporting provisions of EG Cf and NESHAP AAAAA.

Please note that the regulatory language in EG Cf and NESHAP AAAAA is similar but not identical. For ease of review, similar citations are grouped together with the requirements summarized, rather than reproduced exactly, for each.

1.2 Applicability

§60.35f & §63.1959(b)(2) If the calculated NMOC emission rate is equal to or greater than 34 megagrams/50 megagrams per year, the owner or operator shall:

A NMOC emission rate report that demonstrates that Middle Peninsula Landfill and Recycling Facility exceeds both the 34 Mg/yr and 50 Mg/yr thresholds was

submitted to the VDEQ on October 21, 2020. A GCCS will be installed and operated in accordance with the applicable rules as described below.

§60.35f & §63.1959(b)(2)(i) Submit a collection and control system design plan prepared by a professional engineer to the Administrator within 1 year:

§60.35f & §63.1959(b)(2)(ii) Install and start up a collection and control system that captures the gas generated within the landfill within 30 months after:

(A) The first annual report in which the NMOC emission rate equals or exceeds 34/50 Mg/yr, unless Tier 2 or Tier 3 sampling demonstrates that the NMOC emission rate is less than 34/50 Mg/yr.

The submittal of this document fulfills the requirement for the Facility to prepare a GCCS Design Plan in accordance with §60.35f and §63.1959(b)(2). The Design Plan outlines the methodology employed to design a landfill gas collection and control system that will collect, transport, and control landfill gas generated in the entire permitted landfill at final grades.

In addition, proposed alternatives and variances to the standards, including monitoring, recordkeeping, and reporting requirements are discussed in Section 6. Section 7 outlines how the site will implement certain monitoring, recordkeeping and reporting requirements.

The GCCS design outlined in this Plan complies with the specifications for active collection systems as stipulated in §60.40f and §63.1962. If future expansions of the GCCS are necessary, they will be designed to comply with the applicable requirements (and any approved alternatives) and to accommodate existing site conditions.

Furthermore, the EG Cf and NESHAP AAAA require the gas collection system be designed in accordance with general conditions that are contained within the rules. These regulations will be referenced throughout this document, along with a description of how Middle Peninsula Landfill and Recycling Facility is meeting or plans to meet these regulations.

As of the date of this Plan, Middle Peninsula Landfill and Recycling Facility is subject to the GCCS control requirements of 40 CFR 60, Subpart WWW (NSPS WWW). In accordance with NSPS WWW, the landfill previously prepared and submitted a GCCS Design Plan meeting the applicable requirements of NSPS WWW to the VDEQ, most recently on March 30, 2012. The NSPS WWW GCCS Design Plan was approved by VDEQ on March 27, 2013; a copy of this approval is provided in Appendix D.

NSPS WWW was amended on March 26, 2020 to indicate that an affected landfill must comply with NSPS WWW until it becomes subject to more stringent requirements in an approved state plan that implements EG Cf. NESHAP AAAA

requires compliance with NSPS WWW before September 28, 2021. On February 24, 2021, VDEQ indicated that the requirements of Article 43.1 will become applicable on September 27, 2021 to coincide with NESHAP AAAA.

This Plan fulfills the VDEQ requirement to prepare a plan under EG Cf and NESHAP AAAA. Implementation of the EG Cf and NESHAP AAAA operating requirements will begin September 27, 2021. On that date, compliance with NSPS WWW will cease and the Middle Peninsula Landfill and Recycling Facility will transition to compliance with the applicable requirements of EG Cf and NESHAP AAAA.

1.3 Implementation Schedule for GCCS Operations

The site will initiate GCCS operation, including associated monitoring, recordkeeping and reporting in accordance with EG Cf and NESHAP AAAA on September 27, 2021. Table 1 below illustrates the implementation/compliance schedule for GCCS operations.

If VDEQ requires the landfill to modify this design plan, the modification(s) apply prospectively, not retroactively to the landfill.

Table 1 – Implementation Schedule for GCCS Operations*

Regulatory Milestone	Date
NMOC Emission Rate Report submitted (NMOC equals or exceeds 34/Mg/yr)	EG Cf Tier 1 10/21/2020
GCCS Design Plan submitted (per VDEQ email dated 2/24/2021)	By 7/31/2021
Virginia Article 43.1 GCCS standards become effective (per VDEQ email dated 2/24/2021)	9/27/2021
Updated NESHAP AAAA standards become effective	9/27/2021
Initial NESHAP AAAA Semi-Annual Report	Within 180 days of 9/27/2021

2 DESIGN CRITERIA

The GCCS at this site has been designed in accordance with EG Cf and NESHAP AAAA requirements as outlined below.

2.1 Landfill Gas Collection Design

The following regulations dictate when gas collection must be initiated from areas in which municipal solid waste (MSW) has been deposited in the landfill:

§60.33f(a)(2)(ii) & §63.1958(a) Collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of 5 years or more if active; or 2 years or more if closed or at final grade.

[This regulatory citation is commonly known as the 5/2 yr rule, and will be called such when referenced in this design plan.]

Gas extraction devices and the associated pipe network are designed to be installed in all areas with waste that has reached the age of 5 years or older if active; and in waste that has reached the age of 2 years or more if closed or at final grade.

Additionally, the GCCS is designed to comply with the following regulations:

§60.33f(a)(2)(iii) & §63.1959(b)(2)(ii)(B)(3) Collect gas at a sufficient extraction rate.

§60.33f(a)(2)(iv) & §63.1959(b)(2)(ii)(B)(4) Be designed to minimize off-site migration of subsurface gas.

The GCCS is designed to extract LFG at a sufficient rate and minimize offsite migration of subsurface gas. This is achieved by sizing, installing, and operating collection elements as discussed herein.

“Sufficient extraction rate” is defined in EG Cf and NESHAP AAA as “a rate sufficient to maintain a negative pressure at all wellheads in the collection system without causing air infiltration, including any wellheads connected to the system as a result of expansion or excess surface emissions, for the life of the blower.”

Regular wellhead monitoring is conducted in accordance with the applicable requirements to demonstrate that a negative pressure is maintained at all wellheads in the collection system without causing air infiltration. Regular surface emission monitoring (SEM) performed in these areas in accordance with the applicable rules also demonstrates compliance with this requirement. Refer to Appendix C for the Surface Emissions Monitoring Plan.

Design criteria for the GCCS are discussed herein; supporting calculations and drawings are provided in Appendices A and B.

The USEPA's Landfill Gas Emissions Model (LandGEM) is a design tool that utilizes several site-specific characteristics to estimate landfill gas generation rates. Actual operating conditions and gas recovery rates are considered in developing the modeling and when updating these projections and process equipment. If LandGEM revisions are significant enough to warrant a change to the overall system design, a revised design plan will be submitted for approval as required by §60.38f(e)(2) and §63.1981(e)(2).

The GCCS pipe network is designed to accommodate the anticipated maximum flows; however, interim site conditions may require the installation of temporary pipe networks sized to convey interim gas flows. The portions of the pipe network that are planned for use as part of the final design will be appropriately sized to handle the maximum anticipated gas flows.

2.1.1 Gas Collection Density

The applicable rules require that the gas collection system be designed to ensure sufficient density of the LFG extraction points, as follows:

§60.40f(a)(2) & §63.1962(a)(2) The sufficient density of gas collection devices determined in paragraph (a)(1) of this section shall address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

“Sufficient density” is defined in EG Cf and NESHAP AAAA as “any number, spacing, and combination of collection system components, including vertical wells, horizontal collectors, and surface collectors, necessary to maintain emission and migration control as determined by measures of performance set forth in this subpart.”

The well spacing required to achieve comprehensive control of LFG is a function of many parameters, including type of liner and cover; surrounding geology/hydrogeology; landfill geometry; well depth; waste depth, composition and age; and the presence of liquids within the landfill.

Mathematical models can be used to estimate the zone of influence of a well. However, due to the inherent variability of waste within a landfill and numerous other factors, the true influence of an individual well cannot be accurately calculated. The error introduced because of the required simplifying assumptions produces results that typically less reliable than applying extensive industry experience. This approach is consistent with design criteria used at other landfills and will reduce the potential for surface emissions and subsurface migration.

Factors that are typically used to establish adequate well spacing, and which may change as the landfill is built out and ages, may include the following:

- Surface Emission Monitoring (SEM) results
- Site-specific conditions at the time of installation
- Permeability of soils, waste materials, and/or final cover capping systems
- LFG generation rate
- Moisture
- Prior experience/Engineering judgment
- LFG temperature
- Waste depth
- Waste age
- Waste composition

Please note that the preceding list is not intended to be comprehensive.

As a general guide, the spacing of vertical extraction wells generally ranges from 100 to 300 feet, with shallower wells typically installed closer together and deeper wells typically installed at greater intervals. This spacing may vary in current or interim conditions as well as when horizontal collectors are utilized in conjunction with vertical extraction wells.

Horizontal collectors may be installed, as appropriate, in areas where they may be more suitable for use (e.g., in active fill areas where it may not yet be practical to install vertical extraction wells). As a general guide, the spacing of horizontal collectors generally ranges from 100 to 200 feet laterally and approximately 30 to 60 feet vertically (if used in lieu of vertical wells).

The adequacy of well spacing is confirmed via regular monitoring, including wellhead and SEM monitoring. If monitoring indicates that additional gas collection is needed to meet the required operating standards, additional collectors will be installed as necessary.

2.1.2 Landfill Gas Collection System Expandability

§60.40f(a)(1) & §63.1962(a)(1) The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, resistance to the refuse decomposition heat, and ability to isolate individual components or sections for repair or troubleshooting without shutting down entire collection system.

Expandability of the GCCS is achieved by installing items such as in-line isolation valves; flange adapters with blind flanges; and/or HDPE caps along the header and

lateral piping. This allows the GCCS to be modified or expanded as needed in the future.

The Landfill is currently active; thus certain areas of the Landfill may be at interim grades, certain areas may be closed, and certain areas may have not yet been constructed. The evolution of the GCCS during filling of the Landfill will be in general accordance with the guidelines and design criteria outlined in this Plan.

Existing GCCS components are installed in areas of the Landfill which are both at final grade and areas which are not yet at final grade. The GCCS will be expanded into additional areas of the Landfill as filling continues in accordance with EG Cf and NESHAP AAAA. The GCCS design incorporates features (e.g., tees, blind flanges) that permit expansion of the GCCS.

For various reasons, expansion may be accomplished ahead of the regulatory schedule mandated by EG Cf and NESHAP AAAA. In this instance, these components are not subject to the operational monitoring, recordkeeping or reporting requirements until they meet the regulatory schedule regarding waste age and cell closure status.

2.1.3 Fill Settlement

Settlement will occur due to decomposition of the refuse. To accommodate this, the GCCS components are designed and installed with several features to account for settlement including:

- Connection of LFG extraction devices to the LFG transmission piping via a flexible pipe or hose connection. This allows the LFG piping to accommodate changes in the orientation of the LFG transmission piping or LFG extraction well.
- Installation of LFG transmission piping at sufficient slopes so that reasonable amounts of differential and total settlement may occur without causing pipe breakage or disrupting the overall flow gradient of the LFG transmission piping.
- Adequate piping used for the construction of the header and lateral transmission system. Piping materials will be determined as needed during each phase of the construction. Typically, piping that is flexible and absorbs differential settlement without breaking or cracking will be used.
- A boot is typically installed at well penetrations of the membrane cap to seal the penetration, and is designed to accommodate settlement around the well.

2.1.4 Landfill Gas Extraction Component Connections to LFG Transmission Piping

This section details how the collection devices are connected to the GCCS.

§60.40f(b)(3) & §63.1962(b)(3) Collection devices may be connected to the collection header pipes below or above the landfill surface. The connector assembly must include a positive closing throttle valve, any necessary seals and couplings, access couplings and at least one sampling port. The collection devices shall be constructed of PVC, HDPE, fiberglass, stainless steel, or other nonporous material of suitable thickness.

The collection devices are connected to the collection header pipes via lateral piping. The lateral piping is connected to the header either above or below the landfill surface.

The connector assemblies (extraction wellheads) will be located above grade. These assemblies include a positive closing throttle valve; necessary seals and couplings; access couplings; and sampling ports.

At times, liquids may accumulate in vertical LFG wells. In some cases, it may be necessary to install pumps to remove liquid from the wells. When pumps are installed to lower liquid levels, this installation and operation is generally considered corrective action under the applicable regulations.

2.1.5 GCCS Materials

GCCS piping materials will be constructed of PVC, CPVC, HDPE, fiberglass, stainless steel, or other non-porous corrosion-resistant material. Other materials suitable for LFG applications may be used at the discretion of the design engineer. GCCS materials will be designed and installed to:

- Withstand installation forces;
- Withstand static and settlement loads;
- Withstand traffic loads;
- Allow for extension to accommodate additional fill placement (as needed);
- Resist decomposition heat; and
- Include sufficient perforation to allow for adequate gas collection.

2.1.6 Well, Collection Device, & Pipe Network Loading

The materials utilized for the construction of GCCS components have a demonstrated history of performance and have proven to be successful in numerous GCCS applications across the United States. The actual applied loads, including

settlement forces, on GCCS components within the landfill cannot be accurately calculated due to the non-heterogeneous nature of refuse within the landfill.

Various sections of the header or laterals may settle and/or collect condensate, requiring replacement or repair. Should this occur, the affected GCCS components will be repaired or replaced as necessary to maintain compliance with applicable requirements.

2.1.7 Nonproductive Areas

Nonproductive areas may be excluded from the regulatory control requirements, as stated below:

§60.40f(a)(3)(ii) & §63.1962(a)(3)(ii) Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material must be documented and provided to the Administrator upon request. A separate NMOC emissions estimate shall be made for each section proposed for exclusion, and the sum of all such sections must be compared to the NMOC emissions estimate for the entire landfill.

As of the date of this Plan, no areas of the landfill are excluded from gas collection due to LFG “non productivity”. Areas of the landfill that are determined to be nonproductive will be excluded from regulatory control requirements in accordance with the requirements outlined above. Copies of required documentation, including supporting calculations, will be retained onsite and made available upon request. Nonproductive areas may be identified during active, interim, and/or closed conditions.

2.1.8 Asbestos and Non-degradable materials

Any areas of the landfill that contain only asbestos and/or non-degradable materials are not required to be controlled in accordance with the applicable rules, as stated below:

§60.40f(a)(3)(ii) & §63.1962(a)(3)(i) Any segregated area of asbestos or nondegradable material may be excluded from collection if documented as provided under the rule. The documentation must provide the nature, date of deposition, location and amount of asbestos or nondegradable material deposited in the area, and must be provided to the Administrator upon request.

There are no currently dedicated areas for the disposal of asbestos-containing material (ACM) or other non-biodegradable material at the landfill. Further, the landfill does not currently accept regulated ACM, in accordance with its VDEQ solid waste permit.

If the landfill excludes any segregated areas of asbestos or nondegradable material from collection, appropriate documentation will be maintained onsite and made available upon request.

2.1.9 Landfill Gas Extraction Design

Landfill gas extraction is accomplished using gas collection devices that are connected to a vacuum source. This section describes the design considerations of these gas collection devices. Specific requirements that apply to the landfill gas collection and extraction components include the following:

§60.40f(a)(1) & §63.1962(a)(1) The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, and resistance to the refuse decomposition heat, and ability to isolate individual components or sections for repair or troubleshooting without shutting down entire collection system.

§60.40f(b)(1) & §63.1962(b)(1) The landfill gas extraction components must be constructed of polyvinyl chloride (PVC), high density polyethylene (HDPE) pipe, fiberglass, stainless steel, or other non-porous corrosion resistant material of suitable dimensions to: Convey projected amounts of gases; withstand installation, static, and settlement forces; and withstand planned overburden or traffic loads. The collection system must extend as necessary to comply with emission and migration standards. Collection devices such as wells and horizontal collectors must be perforated to allow gas entry without head loss sufficient to impair performance across the intended extent of control. Perforations must be situated with regard to the need to prevent excessive air infiltration.

§60.40f(b)(2) & §63.1962(b)(2) Vertical wells must be placed so as not to endanger underlying liners and must address the occurrence of water within the landfill. Holes and trenches constructed for piped wells and horizontal collectors must be of sufficient cross-section so as to allow for their proper construction and completion including, for example, centering of pipes and placement of gravel backfill. Collection devices must be designed so as not to allow indirect short circuiting of air into the cover or refuse into the collection system or gas into the air. Any gravel used around pipe perforations should be of a dimension so as not to penetrate or block perforations.

The collection devices are connected to the collection system via header and lateral piping. The lateral piping is connected to the header above or below the landfill surface depending on the sequencing of waste disposal operations and the final GCCS design.

As described elsewhere in this Plan, the GCCS components are constructed of materials suitable for LFG applications, and are designed to be compatible with an active landfill environment. Future GCCS expansions will be constructed with components at least of similar or equal quality.

2.1.10 Depths of Vertical Extraction Wells

Vertical wells are designed to prevent damage to the landfill liner and to address the occurrence of perched liquids within the landfill. The vertical wells are installed at the appropriate depths at the discretion of the design engineer and in a manner to capture as much landfill gas as possible while preventing damage to the landfill liner system.

Site-specific conditions may affect the installed depth of vertical wells. These conditions may include the following:

- Waste depth;
- Availability of accurate liner construction records;
- Well locations above or near liner side-slopes or other areas where the liner elevation changes rapidly; and
- Obstructions or other technical difficulties that may impact the drilling operations.

Well depths are generally designed to extend approximately 75 percent of the depth of refuse, with the bottom of the boring at least 10 feet above the bottom liner. Where applicable, shallower wells may be installed at the discretion of the design engineer.

2.1.11 LFG Collection Devices

Vertical wells and horizontal collectors are typically used as the main elements of LFG extraction from the landfill. These collectors are described in greater detail in the following sections.

Appendix B provides a site plan that shows the current layout of the existing GCCS along with typical construction details.

2.1.11.1 Vertical LFG Wells

Vertical collection wells, commonly known as “gas wells,” include extraction wellheads (connector assemblies) that are located above grade. These wellheads include a positive closing throttle valve; necessary seals and couplings; access couplings; and a minimum of two sampling ports. These components aid in the prevention of air intrusion, allow for proper operation of the wellheads, and allow the wellheads to be sampled and monitored.

A vertical well’s zone of influence (ZOI) is determined by the amount of vacuum that can be applied without causing an excessive amount of air intrusion into the landfill. Industry experience will be used to determine the proportions of slotted and unslotted pipe to provide an effective balance between air intrusion control and LFG

collection efficiency. Air intrusion is also minimized by using soil backfill and a bentonite plug in the upper zone of the vertical wells. A boot is typically installed at well penetrations of the membrane cap to seal the penetration.

Air intrusion is also controlled through regular monitoring and adjustment of the vacuum applied at each well, in coordination with appropriate maintenance of the landfill cover system.

Typical well construction details are provided in Appendix B. The facility may also utilize caisson wells or other alternative designs in the future, as appropriate. Details for alternative vertical gas extraction wells will be provided upon request.

2.1.11.2 Horizontal Gas Collectors

Horizontal gas collectors (HGCs) consist of perforated pipes that are installed within a trench excavated directly in the waste. These collectors include extraction wellheads (connector assemblies) that are located above grade. These wellheads include a positive closing throttle valve; necessary seals and couplings; access couplings; and a minimum of two sampling ports. These components aid in the prevention of air intrusion, allow for proper operation of the wellheads, and allow the wellheads to be sampled and monitored.

Horizontal gas collectors (HGCs) may be employed to supplement collection from vertical wells, and as otherwise appropriate in areas where they may be suitable for use. Horizontal gas collectors are typically installed near the surface of the landfill. As a result, atmospheric air can normally be pulled into HGC more easily than into vertical wells. Air infiltration can be minimized by covering HGC with additional layers of refuse, and/or by regulating the vacuum applied at the collector. A boot is typically installed at collector penetrations of the membrane cap to seal the penetration.

Appendix B provides a site plan which shows the current layout of the existing GCCS along with typical construction details.

2.1.11.3 Supplemental Gas Collectors

The landfill may also perform supplemental LFG collection from other features, including but not limited to the following:

- Wells and/or collectors which are installed ahead of the schedule mandated by EG Cf or NESHAP AAAA.
- Gas collection from the leachate collection and removal system (LCRS).
- Near surface collectors which are typically utilized in conjunction with an interim or permanent capping system or for odor control.

- Wells or collectors that are not located within the perimeter of the landfill waste (e.g., “soil wells”).
- Areas containing asbestos or nondegradable material and nonproductive landfill areas per 40 CFR §60.40f(a)(3) & §63.1962(a)(3).

These supplemental gas collection features are not part of the GCCS design and are strictly intended to provide supplemental gas control. Gas collection from these features is instituted on a case-by-case basis and is often only appropriate on an intermittent basis.

Gas at supplemental gas collection points is often of poor quality and/or with low or intermittent gas production and intermittent positive pressure. For example, wells or collectors that are installed prior to the required schedule are typically in more shallow areas where methane generation is still developing.

Surface collectors are shallow gas collectors, typically installed immediately beneath an interim or permanent membrane cap and often not installed in waste. These collectors are commonly installed as a means to monitor static pressure levels and to prevent pressure buildup and uplift of a membrane should pressure develop. Because they are installed very shallow they represent little or no risk of causing a fire or significantly inhibiting anaerobic decomposition.

LFG collection from these supplemental collection points is not subject to the operational standards of EG Cf and NESHAP AAAA including pressure and temperature standards.

Supplemental gas collectors are further addressed in Section 6 of this Plan.

2.1.12 Well Perforations

Collectors are perforated to allow LFG entry without excessive head loss, and the surrounding backfill is sized to prevent blocking of perforations. There are many site-specific factors that are considered when determining the appropriate length of the perforated portion of the gas well:

- Presence of perched liquids contained in the landfill;
- Mitigation of odors (longer perforated sections may be used);
- Depth of waste at the well installation location; and
- Additional height of refuse yet to be placed.

2.1.13 Collection Device Backfill

Gravel, washed aggregate, acceptable crushed stone (with low carbonate content), and/or other inert non-calcareous material of appropriate size is specified to

prevent blockages of the collection device perforations. Other materials not listed above may be used if they provide equivalent performance.

2.1.14 Accessibility

Accessibility of the GCCS components is achieved by installing commonly accessed components (such as wellheads, monitoring ports, etc.) above the landfill surface. For future GCCS expansions, the valves, wellheads, and monitoring ports will be installed to provide accessibility. §60.40f(a)(1) and §63.1962(a)(1) require that the GCCS is designed with the ability to isolate individual components for repair or troubleshooting without having to shut down the entire collection system. The GCCS is designed with appropriate valves to satisfy this requirement.

2.1.15 Collection Device Installation Requirements

Vertical gas extraction wells and horizontal gas collectors will have sufficient cross-section to allow for their proper construction and completion, including centering of the pipes and placement of gravel or other equivalent backfill material. The wells and collectors will be constructed in accordance with a construction quality assurance program implemented by the landfill.

2.1.16 Leachate and Condensate Management

The GCCS design must address leachate and condensate management in accordance with §60.40f(a)(1) and §63.1962(a)(1).

Leachate management is accomplished via the landfill's existing leachate collection and management system. The existing leachate collection and management system consists of a porous drainage layer constructed over the bottom liner system to a series of sumps from which leachate is directed to several on-site storage tanks. All leachate collection and conveyance piping consists of HDPE pipe. From the leachate storage tank(s), leachate is discharged to the local sanitary sewage authority or is hauled to an alternate approved treatment facility.

Liquid condensate formed in the gas piping is a product of the moist, saturated gas undergoing both a temperature reduction and pressure changes (induced by blowers/compressors). Condensate management is accomplished by designing low points in the GCCS piping for collection of the condensate. Condensate collection sumps/drains and/or traps are located at these low points to remove condensate from the transmission piping. Condensate collected at these locations is managed as leachate in conjunction with the landfill's leachate management system and/or managed separately in accordance with the landfill's operating plan.

2.1.17 Control Systems

The regulations require that LFG collected by an affected gas collection system be sent to a compliant system, as follows:

§60.33f(c) & §63.1959(b)(2)(iii) Route all the collected gas to a control system that complies with the requirements in either paragraph (b)(2)(iii)(A), (B) or (C) of this section.

The requirements for the various control systems are summarized below:

§60.33f(c)(1) & §63.1959(b)(2)(iii)(A) A non-enclosed flare designed and operated in accordance with the parameters established in §60.18, except as noted in §60.37f(d) or §63.1959(e).

§60.33f(c)(2) & §63.1959(b)(2)(iii)(B) A control system designed and operated to reduce NMOC by 98 weight-percent, or, when an enclosed combustion device is used for control, to either reduce NMOC by 98 weight percent or reduce the outlet NMOC concentration to less than 20 parts per million by volume, dry basis as hexane at 3 percent oxygen. The reduction efficiency or parts per million by volume must be established by an initial performance test to be completed no later than 180 days after the initial startup of the approved control system using the specified test methods. The performance test is not required for boilers and process heaters with design heat input capacities equal or greater than 44 megawatts that burn landfill gas for compliance with this subpart.

§60.33f(c)(3) & §63.1959(b)(2)(iii)(C) Route all collected gas to a treatment system that processes the collected gas for subsequent sale or beneficial use such as fuel for combustion, production of vehicle fuel, production of high-BTU gas for pipeline injection, or use as a raw material in a chemical manufacturing process. Venting of treated landfill gas to the ambient air is not allowed. If the treated landfill gas cannot be routed for subsequent sale or beneficial use, then the treated landfill gas must be controlled according to the prior paragraphs.

§60.33f(c)(4) & §63.1959(b)(2)(iii)(D) All emissions from any atmospheric vent from the gas treatment system are subject to the requirements of outlined in the prior paragraphs. For purpose of this subpart, atmospheric vents located on the condensate storage tank are not part of the treatment system and are exempt from the control requirements of this section.

The control system may consist of one or more control devices and change over time. All control devices will be designed, installed, and be operated in compliance with the applicable requirements.

The landfill operates a blower and flaring station for the control of LFG. The blower and flaring station currently includes the following main equipment:

- One open flare rated to control a maximum of approximately 6,000 cfm of LFG.
- One open flare rated to control a maximum of approximately 5,100 cfm of LFG.

- LFG blower(s) designed to apply a vacuum to the wellfield and deliver LFG to the flare(s).
- Automatic shutoff valves designed to immediately close upon flare shutdown to prevent uncombusted LFG from being exhausted through the stack.
- Flow monitoring and recordkeeping equipment.
- Heat/flame sensing device.
- Gas pilot system.

In addition to the landfill's control system, collected LFG is also routed to a landfill gas-to-energy (LFGE) facility owned and operated by Waste Management Renewable Energy (WMRE) for treatment and beneficial use. The LFGE facility utilizes LFG treated in accordance with EG Cf and NESHAP AAAA for the generation of electricity. The flares typically operate in parallel with the LFGE plant.

Control devices may be added or removed over time as the volume and quality of LFG produced by the landfill changes. Therefore, the control device(s) operating during the active, interim, and closure timeframes may vary depending on the LFG quantities produced and collected by the GCCS. Adding or removing control devices will be performed in accordance with applicable VDEQ permits.

The following control devices will be implemented as needed and as applicable.

2.1.18 Utility (Non-Enclosed) Flare

When in operation, the utility (non-enclosed) flare(s) will be continuously monitored for the presence of a flame. Monitoring for the presence of a flame will be accomplished by an ultraviolet flame scanner, thermocouple, or comparable device. Absence of a flame will automatically trigger a shutdown of LFG mover(s) and initiate the closure of the valve in the main LFG header pipe.

2.1.19 Treatment System

When in operation, WMRE will operate its LFG treatment system in accordance with the LFGE plant's Treatment System Monitoring Plan. The TSMP is developed in accordance with EG Cf and NESHAP AAAA, and is maintained on site.

3 DESIGN CONSIDERATIONS FOR ACTIVE CONDITIONS

3.1 Landfill Description

The Middle Peninsula Landfill and Recycling Facility is an active municipal solid waste (MSW) landfill located in Glenss, Virginia. Currently, the landfill has a total permitted design capacity of 41,163,810 yd³. Assuming an average waste density of approximately 1,800 lbs/yd³, this corresponds to approximately 37,047,500 tons of MSW. The landfill is expected to achieve this design capacity in about 2067.

The landfill currently operates an active landfill gas collection and control system (GCCS). The GCCS is comprised of both vertical and horizontal extraction components as well as supplemental collection components used to collect LFG. Collected LFG is routed to the landfill's LFGE facility, which utilizes LFG to generate electricity.

LFG not combusted at the LFGE facility is routed to the landfill's existing control device(s), which currently consist of two utility flares. The two utility flares have capacities of 6,000 scfm and 5,100 scfm, respectively.

3.2 Existing Gas Collection Flow

In accordance with EG Cf and NESHAP AAAA, the gas collection system is designed to handle the expected gas flows during the anticipated life of each component of the gas collection system. Portions of the gas collection system that are planned for inclusion in the final design are designed to accommodate both current and future gas flows.

Certain portions of the gas collection system may be designed for temporary use due to filling operations or other site-specific conditions; these portions will be designed to accommodate the gas flows that are anticipated during the time they will be in operation.

The following sections of the rules address the sizing of the gas collection system:

§60.40f(c) & §63.1962(c) Each owner or operator seeking to comply with §60.762(b)(2)(iii) must convey the landfill gas to a control system in compliance with §60.762(b)(2)(iii) through the collection header pipe(s). The gas mover equipment must be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment using the following procedures:

§60.40f(c)(1) & §63.1962(c)(1) For existing collection systems, the flow data must be used to project the maximum flow rate. If no flow data exists, the procedures in paragraph (c)(2) of this section must be used.

§60.40f(c)(2) & §63.1962(c)(2) For new collection systems, the maximum flow rate must be in accordance with the applicable rules.

The LFG generation rate for the landfill was estimated using the U.S. Environmental Protection Agency (EPA) Landfill Gas Emissions Model (LandGEM). The modeling results are based on historic waste acceptance, and projections for future waste acceptance until closure. LandGEM model results are included in Appendix A.

LandGEM utilizes two variables in conjunction with the waste acceptance data to estimate landfill gas generation. These variables are the methane generation potential (L_0) and the methane generation rate constant (k).

In its *Compilation of Air Pollutant Emission Factors (AP-42)*, EPA recommends a L_0 value of 100 cubic meters per megagram of solid waste, and a k value of 0.04 year^{-1} . LandGEM estimates the production of methane from waste decomposition; to calculate the corresponding production of landfill gas, a methane content of 50 percent is assumed.

The average 2020 LFG recovery rate was approximately 3,277 scfm.

The LandGEM model forecasts a peak LFG generation rate of approximately 6,300 scfm in 2068.

3.3 Control Devices and Initial Performance Test

The first Initial Performance Test (IPT) on a control device at the landfill was conducted in September 2000. This establishes the start date associated with the minimum 15-year period described in §60.33f(f)(2) and §63.1957(b)(2).

The landfill currently operates the control devices listed in Table 2. As new or additional control devices are added, the site will obtain proper VDEQ authorizations without revising this Design Plan. Performance tests will be conducted on new control devices as required, and reports will be submitted in accordance with applicable requirements.

Table 2 - List of Control Devices

CD-1 – Open flare rated to approximately 6,000 cfm
CD-3 – Open flare rated to approximately 5,100 cfm

LFG is also routed to an onsite LFGE facility as described in this Plan.

3.3.1 Sizing Gas Collection System/Piping Network

Pipe diameters are designed to minimize gas velocities and head loss within the piping. Piping is generally designed in accordance with the following criteria:

- Anticipated pressure loss within the piping is generally designed to be less than 1 inch of water column (in w.c.) per each 100 foot of pipe.
- Anticipated gas velocity within the piping is generally designed to be less than 30 feet per second in situations where the piping is designed such that gas and condensate are flowing in opposite directions (“countercurrent” flow).

The minimum slope for the LFG collection piping is generally designed to be 3 percent for piping located within the waste mass, and 1 percent for piping located outside the waste mass.

3.3.2 Nonproductive Areas

The rules allow for nonproductive areas to be excluded from control, as follows:

§60.40f(a)(3)(ii) & §63.1962(a)(3)(ii) Any nonproductive area of the landfill may be excluded from control, provided that the total of all excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill. The amount, location, and age of the material must be documented and provided to the Administrator upon request. A separate NMOC emissions estimate must be made for each section proposed for exclusion, and the sum of all such sections must be compared to the NMOC emissions estimate for the entire landfill.

As of the date of this Plan, no areas of the landfill are excluded from gas collection due to LFG “non productivity”. Areas of the landfill that are determined to be nonproductive will be excluded from regulatory control requirements in accordance with the requirements outlined above. Copies of required documentation, including supporting calculations, will be retained onsite and made available upon request. Nonproductive areas may be identified during active, interim, and/or closed conditions.

3.3.3 Asbestos and Non-Degradable Materials

The rules allow for any areas of the landfill that contain only asbestos or non-degradable materials to be excluded from collection, as follows:

§60.40f(a)(3)(i) & §63.1962(a)(3)(i) Any segregated area of asbestos or non-degradable material may be excluded from collection if documented as provided under the rules. The documentation must provide the nature, date of deposition, location and amount of asbestos or non-degradable material deposited in the area, and must be provided to the Administrator upon request.

There are no currently dedicated areas for the disposal of ACM or other non-biodegradable material at the landfill. Further, the landfill does not currently accept regulated ACM, in accordance with its VDEQ solid waste permit.

If the landfill excludes any segregated areas of asbestos or nondegradable material from collection, appropriate documentation will be maintained onsite and made available upon request.

4 DESIGN CONSIDERATIONS FOR INTERIM CONDITIONS

This section addresses the procedures used during interim operating conditions. Interim operating conditions occur when the landfill is still actively accepting waste before it is closed or at final grade. During interim conditions, the gas collection system is typically being installed or expanded to comply with applicable requirements.

To facilitate compliance during interim conditions, a flexible design has been developed. This design reflects the operational difficulties that may be encountered when installing and operating a GCCS while the facility is actively accepting refuse. Collection devices will be installed at locations that allow for needed flexibility during active landfilling operations.

During interim conditions, GCCS monitoring may be required in areas where waste has been placed but has not yet reached final grade. Complying with the applicable requirements under these conditions can present several operational challenges that may include, but are not limited to, the following:

- Components may be damaged during filling operations;
- Areas requiring gas collection may not necessarily coincide with filling operations;
- Gas collection pipe slopes may be affected by differential settlement; and
- Components may be more susceptible to liquids accumulation.

4.1 Gas Collection System Expansion during Interim Conditions

During interim conditions, compliance with the applicable requirements that specify additional gas collection devices and the corresponding expansion of the overall gas collection system will be maintained. These expansions will ensure that LFG is collected at sufficient rates during the interim timeframe, and will be designed and installed to minimize off-site migration of gas.

Specific requirements that apply to gas collection during interim conditions include the following:

§60.41f & §63.1990 *Sufficient density* means any number, spacing, and combination of collection system components, including vertical wells, horizontal collectors, and surface collectors, necessary to maintain emission and migration control as determined by measures of performance set forth in this part.

§60.40f(a)(1) & §63.1962(a)(1) The collection devices within the interior must be certified to achieve comprehensive control of surface gas emissions by a professional engineer. The following issues must be addressed in the design: Depths of refuse, refuse gas generation rates and flow characteristics, cover properties, gas system expandability, leachate and condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, resistance to the refuse decomposition heat, and ability to isolate individual components or sections for repair or troubleshooting without shutting down entire collection system.

§60.40f(a)(2) & §63.1962(a)(2) The sufficient density of gas collection devices determined in paragraph (a)(1) of this section must address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

§60.40f(a)(3) & §63.1962(a)(3) The placement of gas collection devices determined in paragraph (a)(1) of this section must control all gas producing areas, except as provided by paragraphs (a)(3)(i) and (a)(3)(ii) of this section.

§60.36f(b) & §63.1960(b) For purposes of compliance with §60.34f(a)/§63.1958(a), each owner or operator of a controlled landfill must place each well or design component as specified in the approved design plan as provided in §60.38f(d)/§63.1981(d). Each well shall be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:

Five (5) years or more if active; or

Two (2) years or more if closed or at final grade.

§60.40f(c) & §63.1962(c) Each owner or operator seeking to comply with §60.33f(c)/§63.1959(b)(2)(iii) must convey the landfill gas to a control system in compliance with §60.33f(c)/§63.1959(b)(2)(iii) through the collection header pipe(s). The gas mover equipment must be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment using the following procedures:

§60.40f(c)(1) & §63.1962(c)(1) For existing collection systems, the flow data must be used to project the maximum flow rate. If no flow data exists, the procedures in paragraph (c)(2) of this section must be used.

§60.40f(c)(2) & §63.1962(c)(2) For new collection systems, the maximum flow rate must be in accordance with §60.36f(a)(1)/ §63.1960(a)(1).

In accordance with these regulations, the GCCS has been designed to extract LFG at a sufficient rate to minimize the subsurface lateral migration and surface emissions of LFG. This is achieved by sizing GCCS components for the estimated maximum flow rate of LFG. As filling operations progress, the system will be expanded as necessary to meet the applicable requirements.

Landfilling operations will progress over time, resulting in constantly-changing topography at the facility. Due to this, there is no single design that can be presented at this time that represents the precise location of each gas collection

device and the associated piping network. The GCCS will be installed or expanded in accordance with the applicable requirements. The GCCS may also be adjusted, expanded or modified in response to data collected during routine wellhead and SEM monitoring. If the actual landfill gas extraction rate exceeds the GCCS capacity, additional components will be designed and installed in accordance with applicable requirements.

“Sufficient density” of collectors, as required in the applicable rules, is established based on surface emission monitoring, site-specific conditions (waste age, waste density, moisture content, etc.), operational experience, and engineering judgment. This is consistent with spacing criteria used at other landfills and is intended to effectively control surface emissions and subsurface migration of LFG in accordance with applicable requirements.

The header and lateral piping systems are sized to accommodate the peak flows expected during the planned life of the pipe. If the landfill plans to utilize a header and/or lateral pipe only during interim conditions, these pipes will be sized for the anticipated gas flows during the time they are planned to be operational. The portions of the pipe network that will be incorporated into the final design will be appropriately sized to handle the anticipated gas flows at final build-out.

4.1.1 Compatibility with Refuse Filling Operations

During interim conditions, the gas collection system will be designed to be compatible with the waste filling operations of an active landfill. As waste filling operations proceed and portions of the site reach final or near-final grades, additional GCCS components may be installed to comply with the 5-year/2-year requirement. Using this method allows GCCS components to be installed while minimizing interference with ongoing filling operations.

During filling operations, it may be necessary to periodically raise gas extraction wells so that the well remains accessible as additional waste is placed around the well. To maintain worker safety, wells will be raised as needed in advance of waste filling operations. This may require the well to be raised more than 30 days before refuse is placed around the well. During this period, the well may be inaccessible for monitoring. This situation is addressed further in Section 6 of this Design Plan.

4.1.2 Landfill Cover Properties

Daily, intermediate and final cover will be installed over the waste during the normal course of landfill operations in accordance with the solid waste permit. The cover system limits LFG emissions, as well as water and air infiltration.

5 DESIGN CONSIDERATIONS FOR CLOSURE CONDITIONS

Closure conditions apply for the closed landfill, or in areas of the active landfill that have final cover in place.

5.1 Landfill Gas Collection

This section addresses the GCCS requirements that apply when the landfill is no longer operating under interim conditions. The GCCS will be operated in accordance with the applicable requirements for a closed landfill or closed area.

§60.36f(b) & §63.1960(b) For purposes of compliance with the applicable requirements, each owner or operator of a controlled landfill must place each well or design component as specified in the approved design plan as provided in the rules. Each well must be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of:

Five (5) years or more if active; or

Two (2) years or more if closed or at final grade.

In accordance with this requirement, a GCCS must be installed in all areas with waste that is five years or older if open, and two years or more if closed or at final grade. The current placements of collectors at the site follow this requirement.

§60.33f(b)(2)(iii) & §63.1959(b)(2)(ii)(B)(3) Collect gas at a sufficient extraction rate;

§60.33f(b)(2)(iv) & §63.1959(b)(2)(ii)(B)(4) Be designed to minimize off-site migration of subsurface gas.

§60.40f(a)(2) & §63.1962(a)(2) The sufficient density of gas collection devices determined in paragraph (a)(1) of this section must address landfill gas migration issues and augmentation of the collection system through the use of active or passive systems at the landfill perimeter or exterior.

In accordance with these requirements, the GCCS is designed to extract LFG at a sufficient rate to minimize the subsurface lateral migration and surface emissions of LFG. This is achieved by sizing and installing sufficient collection elements, transmission piping, blower(s), and control device(s) for the estimated maximum flow rate of collected LFG.

The GCCS is designed to collect LFG at a sufficient extraction rate, which is defined in §60.41f/§60.1990 as maintaining negative gauge pressure at all wellheads. Presence of negative gauge pressure and minimization of air infiltration will be

demonstrated by monitoring temperature, pressure, and oxygen concentrations at each LFG wellhead in accordance with applicable requirements.

“Sufficient density” is defined in §60.41f/§60.1990 as “any number, spacing, and combination of collection system components necessary to maintain emission and migration control as determined by measures of performance set forth in this part.”

Well spacing at the landfill will be established based on SEM results, site-specific conditions (waste age, waste density, moisture content, etc.), operating experience, and engineering judgment. This is consistent with spacing criteria used at other landfills and is intended to effectively control surface emissions and subsurface migration of LFG in accordance with applicable requirements. The proposed GCCS layout for closure conditions can be found in Appendix B.

The final configuration of wells, collectors, and piping may vary from this proposed design due to modifications required during active and interim conditions. In addition, it may be necessary to replace, re-drill, or relocate wells/collectors due to site-specific conditions. As-built drawings of the gas collection system will be updated as required and a copy of the as-built drawing will be maintained on-site.

The landfill will conduct SEM events as specified in the applicable rules in all affected areas to demonstrate compliance with the performance requirements. If the GCCS does not meet the applicable measures of performance, the GCCS will be adjusted or modified in accordance with the applicable requirements.

5.1.1 Landfill Gas Generation Rates and Flow Characteristics

The maximum modeled LFG flow rate was used to design the GCCS for closure conditions, as described in this section.

§60.33f(b)(2)(i) & §63.1959(b)(2)(ii)(B)(1) An active collection system must be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control system equipment

LFG generation was calculated using the United States Environmental Protection Agency (USEPA) Landfill Gas Estimation Model (LandGEM), which yielded a peak value of approximately 6,300 scfm in 2068. This value is based on the currently permitted design capacity of the facility. A copy of the LFG generation results is provided in Appendix A.

The design and configuration of the system may change based on actual gas flows observed at the landfill as the site approaches closure. The final GCCS piping system is designed to accommodate the estimated peak LFG extraction rate while maintaining vacuum at all wellheads.

5.1.2 Landfill Cover Properties

The final cover system includes an FML system in conjunction with a vegetative soil cover layer. The purpose of the final cover system is to provide a barrier to LFG emissions, as well to limit water and air infiltration. The VDEQ-approved final cover system will be installed upon closure.

5.1.3 Integration with Closure End Use

Currently, the closure end-use for the site is unspecified. It is anticipated that the site will be utilized as open space and will be maintained with limited access and security fencing throughout the post-closure period.

Any modifications to the closure end use will be reviewed by the landfill to evaluate compatibility with the GCCS. Compatibility concerns will be addressed by either altering the proposed closure end-use or by adjusting and/or modifying the GCCS in accordance with applicable requirements.

5.1.4 Operation of GCCS After Closure

The landfill is not required to operate the GCCS indefinitely after closure. The requirements for capping, removing, or decommissioning the GCCS are summarized below:

§60.33f(f) & §63.1957(b) The collection and control system may be capped, removed, or decommissioned if the following criteria are met:

- (1) The landfill is a closed landfill (as defined in §60.41f/§63.1990). A closure report must be submitted to the Administrator as provided in §60.38f/§63.1981(f);
- (2) The gas collection and control system has been in operation a minimum of 15 years or the landfill owner or operator demonstrates that the gas collection and control system will be unable to operate for 15 years due to declining gas flow; and
- (3) Following the procedures specified in §60.35f(b)/§63.1959(c), the calculated NMOC emission rate at the landfill is less than 34/50 Mg/yr on three successive test dates. The test dates must be no less than 90 days apart, and no more than 180 days apart.
- (4) For the closed landfill subcategory (as defined in §60.41), following the procedures specified in §60.35f(b), the calculated NMOC emission rate at the landfill is less than 50 megagrams per year on three successive test dates. The test dates must be no less than 90 days apart, and no more than 180 days apart.

After the above-referenced requirements for removal are satisfied, the GCCS may still be operated, but it will no longer be subject to the operational requirements of EG Cf and/or NESHAP AAAA.

6 ALTERNATIVES

The rules allow for the landfill to request alternatives to the operational standards, test methods, procedures, compliance requirements, monitoring, record keeping, and reporting provisions as follows:

§60.38f(d)(2) & §63.1981(d)(2) The collection and control system design plan must include any alternatives to the operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping or reporting provisions proposed by the owner or operator.

The following sections summarize existing VDEQ-approved alternates as well as additional proposed alternates in accordance with these provisions.

6.1 Previously Approved Alternatives

The landfill's March 2012 GCCS Design Plan incorporated several proposed clarifications and/or alternates to applicable GCCS standards. These were approved by VDEQ in a March 27, 2013 letter, a copy of which is provided in Appendix D.

The approved alternatives were developed and submitted pursuant to the requirements of NSPS Subpart WWW, which were applicable at that time. The landfill intends to continue GCCS operation under EG Cf and NESHAP AAAA in accordance with the applicable elements of the previously-approved alternates included in this section.

Please note that, due to changes to certain provisions of the rules, certain elements of previously-approved alternates are no longer applicable (e.g., establishing a wellhead higher operating value for oxygen) and certain clarifications are no longer applicable (e.g., submittal of wellhead alternative timelines within 30 days of an initial exceedance; exemption from system expansion requirement during 180-day collector startup period). These changes are reflected below.

6.1.1 Acceptable Pressure Limit, Geomembrane Cover

In areas of a landfill where a geomembrane or synthetic cover is being used, §60.34f(b)(2) and §63.1958(b)(2) allow the owner or operator to develop acceptable pressure limits in the design plan.

The following calculation establishes the acceptable positive pressure at NSPS GCCS wellheads operated in areas with a geomembrane (synthetic landfill cover), given the following:

- Minimum soil cover over geomembrane = 24 inches
- Average soil density = 120 pounds/cubic foot

Soil pressure on membrane:

$$(24 \text{ inches}) \left(\frac{1 \text{ foot}}{12 \text{ in}} \right) \left(\frac{120 \text{ pounds}}{1 \text{ cubic foot}} \right) \\ = 240 \text{ lb/sf } (= 46.1 \text{ in-w.c.})$$

Applying a safety factor of 4, the acceptable wellhead pressure limit for wells in a geomembrane or synthetic cover area is:

$$= 46.1 \text{ in-w.c.} / 4 \text{ (SF)}$$

$$= \underline{\underline{11.5 \text{ in-w.c.}}}$$

6.1.2 Permanent Well Decommissioning

During the course of GCCS operation the landfill will, as appropriate, identify selected wells that exhibit characteristics including, but not limited to:

- Diminished gas flows and/or gas quality.
- Evidence of overlapping influence from adjacent wells.
- Well(s) is no longer required for odor control due to capping or other reasons.

Prior to permanently decommissioning a well(s), the landfill will submit a letter to VDEQ requesting approval of the proposed GCCS change, including support data and other pertinent information. Copies of correspondence related to well decommissioning will be maintained on site on an ongoing basis as they occur.

Decommissioned wells will be capped either below or above grade, as appropriate, and the wellhead and piping connection to the header piping removed.

Please note that if a well is replaced or redrilled, the existing collection device may be capped/abandoned/removed by the landfill without notification or prior approval to VDEQ. A unique identification label will be assigned to replacement wells and replacement wells will be noted in the semi-annual reports.

6.1.3 Temporary Well Decommissioning (Operational Change)

Non-productive LFG extraction wells generally have low landfill gas generation rates that make it difficult to simultaneously operate wellheads at negative pressure while minimizing oxygen intrusion. Per EG Cf and NESHAP AAAA, the landfill is permitted to decommission LFG extraction wells that are no longer productive. Implicit in this is the assumption that once a LFG extraction well becomes non-productive its gas generation will never recover.

The EPA has issued a determination regarding intermittent operation of wellheads as an alternative to decommissioning. In a letter to the Florida Department of Environmental Protection, the EPA approved such a request by the Orange County Solid Waste Management Facility.

The primary benefit of temporarily decommissioning a well (as opposed to permanent well decommissioning) is that if gas production should recover in the future, the landfill would be able to quickly control that gas because these wells are immediately available to be returned to service. By not permanently decommissioning non-productive wells, the delay that would occur from the time gas production recovers to when a new LFG extraction well could be installed and connected to the LFG extraction system are eliminated.

The landfill will follow the following procedures for temporarily decommissioning interior wellheads where gas production has declined but permanent decommissioning and removal of the well may not yet be appropriate:

- When a well is closed due to declining gas production, it will be recorded and maintained. (Closed wells and collectors will not be subject to EG Cf and NESHAP AAAA operational requirements for pressure.)
- Methane surface emissions monitoring will continue to be conducted in accordance with the EG Cf and NESHAP AAAA requirements (i.e. quarterly, at a minimum). Standard remediation steps, including evaluating the need to return wells to full-time service, will be followed if SEM exceedances are detected.
- Should monitoring indicate that gas production has recovered at the well, it will be re-activated as appropriate.

6.1.4 Temporary Removal from Service

The landfill may occasionally temporarily remove GCCS collection points (well or collector) from service in the active (or working face) area of the landfill for safety and/or operational reasons. This may occur when filling is occurring in the immediate area of a collection point and the point must be removed from service such that it can be raised or extended through the addition of additional pipe to the collector. This may also occur when filling is occurring in the immediate area of a

vacuum source (header or lateral) for the collection point and the header or lateral is temporarily removed in order to be repaired, relocated or raised. During a period where a collector is temporarily removed from service, the collector is not subject to the regular monitoring and operational standards of EG Cf and NESHAP AAAA.

The landfill will maintain records of any GCCS wells which are temporarily removed from service and will include this information in semi-annual reports to VDEQ. In general, wells will be removed from service for periods not exceeding 60 days. The landfill will submit a written request to VDEQ for approval in the event that a well must be removed from service for longer than 60 days.

6.1.5 Gas Well Replacement

In select circumstances, the landfill may replace existing GCCS collection points such as horizontal collectors or vertical wells with new GCCS collection points. For example, in active filling areas or areas that are not yet at final grade, the landfill may elect to install horizontal collectors and/or vertical wells with remote wellheads for a temporary period of operation. After a period of time, it may be appropriate for these collectors to be replaced with a new collector that is better suited to the current condition than the old collector (e.g., if the landfill has reached intermediate or final grade). For example, a horizontal collector might be replaced by one or more vertical gas wells once an area reaches intermediate or final grade. Or a horizontal collector or vertical well might be damaged by filling operations or landfill settlement and replaced by a new GCCS collector.

In these circumstances, the new GCCS collection point(s) will be designed in accordance with this Plan and be designed to equal, or exceed the collector(s) being replaced. Further, the GCCS collection point(s) will not be removed from service until the replacement collection point(s) are installed and operational.

Because these changes will occur in accordance with the design parameters of this Plan, gas well replacement is not a design change which requires approval by the VDEQ (such as permanent well decommissioning).

The landfill will maintain records of GCCS wells which are replaced, and will summarize replacement of GCCS wells in the NSPS semi-annual reports.

6.1.6 Wellhead Higher Operating Values – Temperature Standard

EG Cf and NESHAP AAAA have established the following operational standard for wellhead temperature:

§60.34f & §63.1958(c) Operate each interior wellhead in the collection system with a landfill gas temperature less than 62.8 degrees Celsius (145 degrees Fahrenheit). The owner or operator may establish a higher operating temperature value at a particular well. A higher operating value demonstration must be submitted to the Administrator for approval and must include supporting data demonstrating that the elevated parameter neither causes fires nor significantly inhibits anaerobic

decomposition by killing methanogens. The demonstration must satisfy both criteria in order to be approved (i.e., neither causing fires nor killing methanogens is acceptable).

The landfill has previously established VDEQ-approved higher operating values (HOVs) for temperature at several gas collectors. These are summarized in Table 3 below.

Table 3 – Agency-Approved Wellhead Temperature HOVs

Device Name	Variance (°F)	Effective Date	Device Status
WMMP0014	140	11/7/2012	Decommissioned
WMMP0023	150	11/7/2012	Decommissioned
WMMP0050	145	11/7/2012	Decommissioned
WMMP0801	145	11/7/2012	Decommissioned
WMMP0802	145	11/7/2012	Decommissioned
WMMP0901	145	11/7/2012	Decommissioned
WMMP0902	140	11/7/2012	Decommissioned
WMP202R1	145	11/7/2012	Active
WMMP0601	141	1/16/2013	Decommissioned
WMMP0104	146	6/24/2014	Decommissioned
WMMP801R	146	6/24/2014	Active
WMMP46R1	141	8/6/2014	Decommissioned
WMP503R1	141	10/30/2014	Active
WMP507R1	146	12/30/2014	Active
WMMP703R	151	3/6/2015	Active
WMMP102R	151	11/24/2015	Active
WMMP13R1	151	11/24/2015	Decommissioned
WMMP15R2	151	11/24/2015	Active
WMMP205R	151	11/24/2015	Decommissioned
WMMP0809	151	7/17/2018	Active
WMP508R2	151	8/7/2019	Active
WMMP0606	151	10/1/2019	Active
WMP601R2	151	10/17/2019	Active
WMMP052R	151	12/4/2019	Active
WMMP13R2	151	2/21/2020	Active
WMMP53R2	151	2/21/2020	Active
WMMP901R	151	2/21/2020	Active
WMMP0607	151	4/14/2021	Active

Note: As indicated above, NESHAP AAAA establishes a wellhead temperature operational standard of 145°F, which supersedes these established HOVs. Previously-approved HOVs less than 145°F are therefore provided herein for completeness only.

During the course of GCCS operation, as appropriate, the landfill will identify additional selected wells at which the establishment of an HOV for temperature is suitable. Future temperature HOV requests at the landfill will be submitted in accordance with the following previously-established procedures:

- Until approval has been granted, all exceedances need to be included in the semi-annual report.
- Alternate operating parameter requests must include:
 - At minimum, the most recent six months of data.
 - A reason why an alternative parameter is being requested (e.g., leachate recirculation).
 - A summary of all corrective action(s) already taken.

6.1.7 Supplemental Gas Collectors

The landfill may also perform LFG collection from other supplemental gas collection points, which could include landfill features such as:

- Near-surface gas collectors (SC) which are integrated into the FML capping system,
- Gas collection from the leachate collection and removal system (LCRS),
- Wells or collectors that are not located within the perimeter of the landfill waste (e.g., “soil wells”),
- Gas collectors which are installed ahead of the schedule mandated by EG Cf and NESHAP AAAA,
- Areas containing asbestos or nondegradable material and nonproductive landfill areas per EG Cf and NESHAP AAAA, and
- Decommissioned wells.

These supplemental gas collection features are not part of the GCCS design and are strictly intended to provide supplemental gas control. Gas collection from these landfill features is instituted on a case by case basis, and is often only appropriate on an intermittent basis.

Supplemental gas collectors are either installed in areas not (or not yet) subject to NSPS Subpart WWW, or are not designed with the primary function being NSPS gas control (e.g., LCRS collection or near-surface gas collectors). As a result, gas quality at supplemental gas collection points is often of poor quality (with high oxygen and low methane levels) and/or may experience intermittent positive pressures. For

example, SCs are installed immediately beneath the FML to monitor static pressure levels, and as a means to prevent pressure buildup and uplift of the FML cap should pressure develop. These collectors are shallow and thus likely to experience poor gas quality (high oxygen and low methane levels) under vacuum; however because they are not installed at depth within the waste they represent little or no risk of causing a fire or significantly inhibiting anaerobic decomposition.

Therefore, LFG collection from supplemental collection points is not considered subject to the wellhead pressure and temperature operational standards of EG Cf and NESHAP AAAA.

The landfill does, however, monitor all active GCCS collection points (including supplemental gas collectors) on a regular basis.

6.1.8 Early Installation of Collection Devices

The requirements of §60.36f(b) and §63.1960(b) state that each collection device shall be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of five years or more in active areas, or two years or more if closed or at final grade.

In certain cases, the landfill may elect to install LFG collection devices in advance of this schedule. In these situations, the installation of such LFG collection devices shall be considered voluntary, and these collectors shall not be subject to the operational and/or recordkeeping requirements outlined in EG Cf and NESHAP AAAA until the time thresholds are reached.

The landfill will maintain records of any collectors installed in advance of this schedule.

6.2 Proposed Additional Alternatives

In accordance with EG Cf and NESHAP AAAA the landfill proposes the following additional alternatives to operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping or reporting provisions.

6.2.1 Monthly Monitoring Methods

§60.37f(a)(2) & §63.1961(a)(2) require monthly wellhead monitoring of nitrogen or oxygen concentrations in the landfill gas. The rules allow for the use of EPA Method 3C to measure the nitrogen levels and the use of either EPA Method 3A, 3C, or ASTM D6522-11 to measure the oxygen content.

In accordance with the general state-of-the-practice procedures, the landfill proposes to use a portable monitoring instrument (e.g., Landtec GEM 500, Landtec GEM 2000, LMS, Envision, or equivalent instrument) to perform this monitoring.

The monitoring equipment will be calibrated in accordance with manufacturer's recommendations and applicable requirements of EG Cf and NESHAP AAAA.

6.2.2 Replacement Well Higher Operating Value Succession

It may be appropriate to periodically establish wellhead HOVs for temperature at locations where internal landfill conditions are conducive to thermophilic methanogenesis. §60.34f(c) and §63.1958(c). Future HOV demonstrations will be submitted to VDEQ for approval in accordance with Section 7 of this Plan.

The landfill is requesting that, if a VDEQ-approved HOV is established for a collection device, the approved HOV also applies to any redrilled or replacement of that device in accordance with this Plan.

Given that redrilled or replacement wells are typically located very close to the device being replaced, it is expected that similar internal landfill conditions will exist for the replacement well as existed for the original well.

6.2.3 Surface Emission Monitoring (SEM) – Alternative Remedies

NESHAP AAAA and EG Cf require the landfill owner or operator to take corrective action to remedy any incidents of methane concentrations more than 500 ppm above background that are detected during SEM. The landfill will perform the initial SEM event and 10-day/1-month re-monitoring events, if necessary, in accordance with the rules and this Plan.

§60.36f(c)(4)(v) & §63.1960(c)(4)(v) For any location where monitored methane concentration equals or exceeds 500 parts per million above background three times within a quarterly period, a new well or other collection device must be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes or control device, and a corresponding timeline for installation may be submitted to the Administrator for approval.

For any location where three (3) SEM exceedances occur within a calendar quarter, the following alternative remedies may be implemented to correct SEM exceedances within the 120-day timeline. These remedies may include, but are not limited to, one or more of the following measures:

- a. Installation of, or upgrades to, conveyance and/or control equipment (e.g., larger flare, additional blowers, etc.).
- b. Installation of a liquid management system in the extraction wells or sumps.
- c. Installation/modification of other ancillary equipment (e.g., larger air compressor, additional air and condensate force main lines, etc.)
- d. Installation of additional or replacement LFG collection devices;

- e. Repair or replacement of LFG header or lateral piping;
- f. Repair of the landfill cap to minimize LFG migration and/or air infiltration; and
- g. Repair or replacement of header valves.

Please note that this list is not intended to be exhaustive. Other appropriate alternative remedies are also covered under this alternative. Any enhancements made to the existing GCCS will be documented in the semi-annual reports. Please note that the landfill will proactively implement this variance such that SEM exceedances are addressed as expeditiously as possible.

If SEM exceedance remedies cannot be implemented within the 120-day timeframe, the landfill will submit an alternative compliance schedule to VDEQ for review and approval.

6.2.4 SEM for Closed Portions of the Landfill

The landfill is requesting that areas of the landfill that have been closed and capped in accordance with applicable requirements be treated as a closed landfill for SEM events. These closed areas will be monitored in accordance with the following sections of the rules:

§60.37f(f) & §63.1961(f) Any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any methane reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for the landfill to quarterly monitoring.

6.2.5 Operation of Near Surface Collectors (Pin Wells) for Odor Control

The landfill is requesting to install and utilize near-surface landfill gas extraction/odor control devices referred to as “pin wells” as an additional means for supplemental gas collection.

These “pin wells” are near surface collectors which are not installed with the same design as a typical vertical extraction well and which are intended for temporary use only. The intent of pin wells is to provide gas collection in waste zones near the surface of the landfill. The well is not intended to replace traditional vertical gas extraction wells that are typically drilled much deeper, but rather to supplement them when warranted. Accordingly, the primary objective of the wells is for odor control in landfill areas that do not have final cover.

These wells can be installed, and removed, much more quickly than traditional wells. Accordingly, the landfill is not seeking approval to use the wells to demonstrate adequate collection coverage per the operational standards of the applicable rules. Rather, the landfill seeks approval and flexibility to augment the

existing system by installing and removing these wells as necessary to control odors on a temporary basis.

Pin wells are constructed by driving a “nail” or pilot probe to a depth of approximately twenty (20) feet. Once the probe is removed, a PVC pipe (the pin well casing) is fitted into the hole. A gravel pack is placed in the annulus between the well casing and the sidewalls of the hole to a depth approximately five feet below the surface. The remaining annular space is sealed with a sealant such as bentonite. The lower section of the pipe is perforated to allow for gas extraction. The well is fitted with a wellhead and connected to a vacuum source. Pin wells are often developed in clusters, and construction methods/specifications may vary slightly.

We request the following procedures for “pin wells”:

- We request approval to install and remove pin wells as necessary without the requirements for further VDEQ approval since these wells will not be used to demonstrate adequate coverage under EG Cf and NESHAP AAAA.
- Pin wells may be decommissioned, and thus experience positive pressure as allowed in §60.34f(b)(3) and §63.1958(b)(3), at any time. Because the pin wells will be used as temporary, discretionary, and/or supplemental collectors, the landfill may install, remove, open and close each pin well at its discretion.

7 OPERATING CLARIFICATIONS

This section clarifies how this site will implement certain monitoring, recordkeeping and reporting obligations under EG Cf and NESHAP AAAA.

7.1 Alternative Timeline Request

According to rules, the landfill must request an alternative timeline if the site requires more than 120 days from the initial exceedance to correct a well exceedance.

§60.36f(a)(3) & §63.1960(a)(3) For the purpose of demonstrating whether the gas collection system flow rate is sufficient to determine compliance with the rules, the owner or operator must measure gauge pressure in the gas collection header applied to each individual well, monthly. If a positive pressure exists, action must be initiated to correct the exceedance within 5 calendar days, except for the three conditions allowed under the rules. Any attempted corrective measure must not cause exceedances of other operational or performance standards.

(i) If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement of positive pressure, the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after positive pressure was first measured. The owner or operator must keep records according to §60.39f(e)(3)/§63.1983(e)(3).

(ii) If corrective actions cannot be fully implemented within 60 days following the positive pressure measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the positive pressure measurement. The owner or operator must submit the items listed in the rules as part of the next annual report. The owner or operator must keep records according to the applicable requirements.

(iii) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to the applicable requirements. The owner or operator must keep records according to the rules.

§60.36f(a)(5) & §63.1960(a)(4) For the purpose of identifying whether excess air infiltration into the landfill is occurring, the owner or operator must monitor each well monthly for temperature as provided in the rule. If a well exceeds the operating parameter for temperature, action must be initiated to correct the exceedance within 5 calendar days. Any attempted corrective measure must not cause exceedances of other operational or performance standards.

(i) If a landfill gas temperature less than 145 degrees Fahrenheit cannot be achieved within 15 calendar days of the first measurement of landfill gas temperature greater than 145 degrees Fahrenheit, the owner or operator must conduct a root cause analysis and correct the exceedance as soon as practicable, but no later than 60 days after a landfill gas temperature greater than 145 degrees was first measured. The owner or operator must keep records according to the rule.

(ii) If corrective actions cannot be fully implemented within 60 days following the elevated temperature measurement for which the root cause analysis was required, the owner or operator must also conduct a corrective action analysis and develop an implementation schedule to complete the corrective action(s) as soon as practicable, but no more than 120 days following the measurement of landfill gas temperature greater than 145 degrees Fahrenheit. The owner or operator must submit the items listed in the applicable requirements as part of the next semiannual report. The owner or operator must keep records according to the rule.

(iii) If corrective action is expected to take longer than 120 days to complete after the initial exceedance, the owner or operator must submit the root cause analysis, corrective action analysis, and corresponding implementation timeline to the Administrator, according to the applicable requirements. The owner or operator must keep records according to the rule.

According to these requirements, the site is only required to submit the root cause analysis and corrective action analysis to the Administrator as part of an alternative timeline request for corrective actions that may take longer than 120 days from the initial exceedance date. This alternative timeline request with the root cause analysis and corrective action analysis must be submitted within 75 days after the initial exceedance.

In accordance with requirements for the annual/semiannual report, if the exceedance takes more than 60 days to correct, the corrective action analysis should be included in the annual/semiannual report. However, for landfill gas collection device exceedances that are remediated after 15 days but before 60 days following the initial exceedance, records of the root cause analysis will be maintained but will not be submitted to VDEQ.

For remediation efforts that are corrected between 60-days and 120-days of the initial exceedance, the root cause and corrective action analyses will be submitted in the annual/semiannual report. If, however, remediation efforts are expected to require more than 120 days, an alternative timeline request will be submitted by day 75 and will include the root cause and corrective action analysis.

If the landfill does not receive response from VDEQ within 30 calendar-days of submittal of the alternative timeline request, it will assume the alternative timeline is approved and the exceedance, plan for corrective action, and corresponding alternative timeline will not be considered a deviation of the standards.

7.2 Frequency to Update As-built Drawings

The landfill must keep an up-to-date readily accessible plot map showing each existing and planned collector. An up-to-date plot map is typically called an as-built.

§60.39f(d) & §63.1983(d) Except as provided in the rule, each owner or operator subject to the provisions of this subpart must keep for the life of the collection system an up-to-date, readily accessible plot map showing each existing and planned collector in the system and providing a unique identification location label for each collector.

(1) Each owner or operator subject to the provisions of this subpart must keep up-to-date, readily accessible records of the installation date and location of all newly installed collectors as specified under the rule.

As-built maps are updated only upon completion of construction projects that include upgrades and/or additions to the gas collection system.

Since there is no defined frequency for preparing/updating an as-built of the gas collection system, the landfill will update the as-built on an annual basis in years that changes to or construction of the gas collection system are performed.

7.3 Exclusion of Dangerous Areas from SEM requirements

Areas with steep slopes or other dangerous areas are excluded from the SEM requirements as follows:

§60.34f(d) & §63.1958(d)(1) Areas with steep slopes or other dangerous areas may be excluded from surface testing.

The following landfill areas are considered dangerous and will thus be excluded from SEM:

- a. Roads;
- b. Working areas and/or the working face;
- c. Truck traffic areas;
- d. Steep and dangerous slopes;
- e. Icy, snow covered, and/or extremely muddy side slopes;
- f. Areas where the landfill cover material has been exposed for the express purpose of installing, expanding, replacing, or repairing components of the LFG, leachate, or gas condensate management systems.

7.4 Clarifications for Enhanced Monitoring

7.4.1 Timing for Initiation

The enhanced monitoring provisions of NESHAP AAAA apply no later than September 27, 2021 according to the following schedule:

§63.1961(a)(5) states: “you must initiate enhanced monitoring at each well with a measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit) as follows...(vii) The enhanced monitoring [in] this paragraph (a)(5) must begin 7 days after the first measurement of landfill gas temperature greater than 62.8 degrees Celsius (145 degrees Fahrenheit)...”

The following clarifications are necessary for these monitoring requirements:

- The regulation as written suggests that a landfill must conduct enhanced monitoring after ANY occurrence of a temperature measurement in excess of 145°F. The preamble to the NESHAP includes the following statement: “Enhanced monitoring begins 7 days after the first reading exceeding 145°F is recorded and continues until the measured wellhead operating temperature is 145°F or less, or an HOV is approved.”

However, the preamble also states the following: “Furthermore, the concern that the enhanced monitoring requirements would continue in perpetuity is unsubstantiated. First, landfills have up to 7 days to adjust the well to achieve a lower temperature before the enhanced monitoring requirements are triggered (40 CFR 63.1961(a)(5)(vii)). Second, the enhanced monitoring can stop once the well temperature drops back to 145°F or less.”

The landfill thus clarifies that additional monitoring and tuning can be performed during the 7-day period after an initial exceedance before enhanced monitoring activities are required. Furthermore, if an initial exceedance is corrected within the 7-day period, enhanced monitoring will not be initiated for that well.

- The regulation as written establishes a set date on the initiation of enhanced monitoring. The phrase “must begin 7 days after the first measurement” suggests that a landfill must initiate the enhanced monitoring exactly 7 days after the initial exceedance, even if that date falls on a holiday or weekend.

The landfill thus clarifies that it will initiate enhanced monitoring **within 7 days** of the initial exceedance, unless the corrective actions taken within the first 7 days (as discussed above) reduce the well temperature to 145°F or less.

7.4.2 Down-Well Monitoring

The enhanced monitoring provisions of NESHAP AAAA include the requirement to measure the temperature of the landfill gas every 10 vertical feet of the well on an annual basis for each wellhead with a gas temperature greater than 165°F.

§63.1961(a)(6) states: “For each wellhead with a measurement of landfill gas temperature greater than or equal to 73.9 degrees Celsius (165 degrees Fahrenheit), annually monitor temperature of the landfill gas every 10 vertical feet of the well. This temperature can be monitored either with a removable thermometer, or using temporary or permanent thermocouples installed in the well.”

The landfill establishes the following clarifications related to this monitoring requirement:

- The “annual” monitoring requirement is understood to require that the monitoring be performed at least once at any time during the 12 month period following the first temperature measurement greater than or equal to 165°F.
- If the measured temperature at the wellhead drops below 165°F during the 12-month period following the initial exceedance, down-well monitoring is no longer required for that well. If the measured temperature drops below 165°F before the initial annual down-well monitoring is performed, that initial monitoring is no longer required.
- If a Higher Operating Value is approved by VDEQ for the well before the initial annual down-well monitoring is performed, that initial monitoring is no longer required.
- In order to conduct the down-well monitoring, the well will be shut off and the wellhead removed. Down-well temperatures recorded while the well is operating are not representative due to heat transfer and mixing that occurs during gas extraction. In addition, shutting off the well prior to monitoring reduces risk to the technician performing the monitoring. Additional safety measures will be implemented, as appropriate.
- The liquid level in the well will be measured prior to conducting down-hole temperature monitoring. To minimize the potential for damage to the temperature monitoring probe, the down-well temperature monitoring will terminate above the liquid level, if present.
- If conditions at the wellhead (e.g., visual indicators, temperature, gas quality, carbon monoxide, etc.) suggest that a subsurface fire may be occurring, the well will be shut off in accordance with §60.34f(b)(1) and §63.1958(b)(1). To reduce the potential for oxygen intrusion and unnecessary risk to personnel, the wellhead will not be removed, and

down-well temperature will not be measured until data indicate the subsurface fire is no longer occurring. In these cases, the status of the affected well will be reported in the semi-annual report in accordance with §63.1981(h)(8).

7.4.3 Carbon Monoxide Measurement

NESHAP AAAA requires measurement of carbon monoxide during enhanced monitoring at affected wells using EPA Method 10 (§63.1961(a)(5)(vi)(A) and (B)). EPA Method 10 is a field method developed primarily to measure carbon monoxide from stationary combustion units by extracting continuous samples from an exhaust stack. Use of this method at a landfill gas extraction well operating under vacuum presents numerous technical issues, and its use is not suitable for field or laboratory testing of carbon monoxide concentrations in raw landfill gas.

As of the date of this Plan, industry groups are working with USEPA to obtain approval for an alternative to Method 10 for this monitoring. The landfill anticipates that this alternative will be approved before any enhanced monitoring is required.

Absent that approval, however, the site proposes to collect and analyze samples for carbon monoxide using any of the following (or equivalent) analytical methods:

- ASTM D 1945-03 or the latest version;
- ASTM D 1946-90 or the latest version;
- EPA Method 3-C;
- Modified Method 25-C reporting only the CO fraction;
- On-site portable gas chromatograph capable of measuring CO; or
- Other instruments demonstrated to measure CO in landfill gas with similar performance as the methods described above.

7.5 Computation of 3-Hour Block Average Temperatures

NESHAP AAAA requires inclusion of data collected during “[*monitoring system breakdowns, repairs, calibration checks, and zero (low-level) and high-level adjustments*]” and during startups, shutdowns and malfunctions, in calculating the 3-hour combustion temperature average for compliance (§63.1975).

This is inconsistent with general provisions in Subpart A (i.e., §63.8(c)(2)-(8) and 63.10(e)); as well as §63.1961(h), which excludes monitoring system malfunctions, breakdown, repairs, and system checks from the 3-hour temperature average. Furthermore, eighteen (18) other NESHAPs exclude monitoring breakdown, repairs

etc. from compliance averaging requirements (see 63.7120 of Lime Plants Subpart AAAAA and 63.1416 of Amino/Phenolic Resins Subpart 000 as examples).

As of the date of this Plan, the issue of determining the 3-hour average combustion temperature has been raised to EPA as part of an industry petition. The landfill anticipates that this will result in rule correction/clarification.

In the interim, however, the landfill will exclude monitoring system malfunctions, breakdown, repairs, and system checks from the 3-hour temperature average in accordance with the applicable provisions of the NESHAP.

7.6 Certification of Prior Reports

Per §63.1981, NESHAP AAAA does not require re-submittal of the following reports if they were previously submitted by the landfill under 40 CFR Part 60, Subpart WWW; 40 CFR Part 60, Subpart XXX; or a federal plan or EPA-approved and effective state plan or tribal plan that implements either 40 CFR Part 60, Subpart Cc or 40 CFR Part 60, Subpart Cf:

- Design capacity report;
- Amended design capacity report;
- Initial NMOC emission rate report;
- Initial or revised collection and control system design plan;
- Closure report;
- Equipment removal report; or
- Initial performance test report.

§63.1981 also notes, however, that “[Y]ou must include a statement certifying prior submission of the respective report(s) and the date of submittal in the first semiannual report required in this section.”

This certification will be included, as applicable, in the first semi-annual report submitted after September 27, 2021.

7.7 Flow Monitoring Where No Bypass Exists

Both NESHAP AAAA (§63.1961(b)(2), (c)(2), and (g)) and EG Cf (§60.37f(b)(2), (c)(2), and (g)) require that the owner or operator calibrate, maintain, and operate a device that records flow to the control device or treatment system, as well as bypass of the control device or treatment system, if applicable.

The requirement to monitor bypass flow is not a separate requirement and does not apply to closed loop control systems. EPA included the phrase "as applicable" in the regulations to acknowledge not every system will have a bypass.

Most landfill GCCSs do not include a control or treatment system bypass to atmosphere.

If the system is designed such that there is no physical means to bypass the control device or treatment system, the landfill clarifies that only the flow to a control device or treatment system will be monitored, including flow that is re-routed from one device to another.

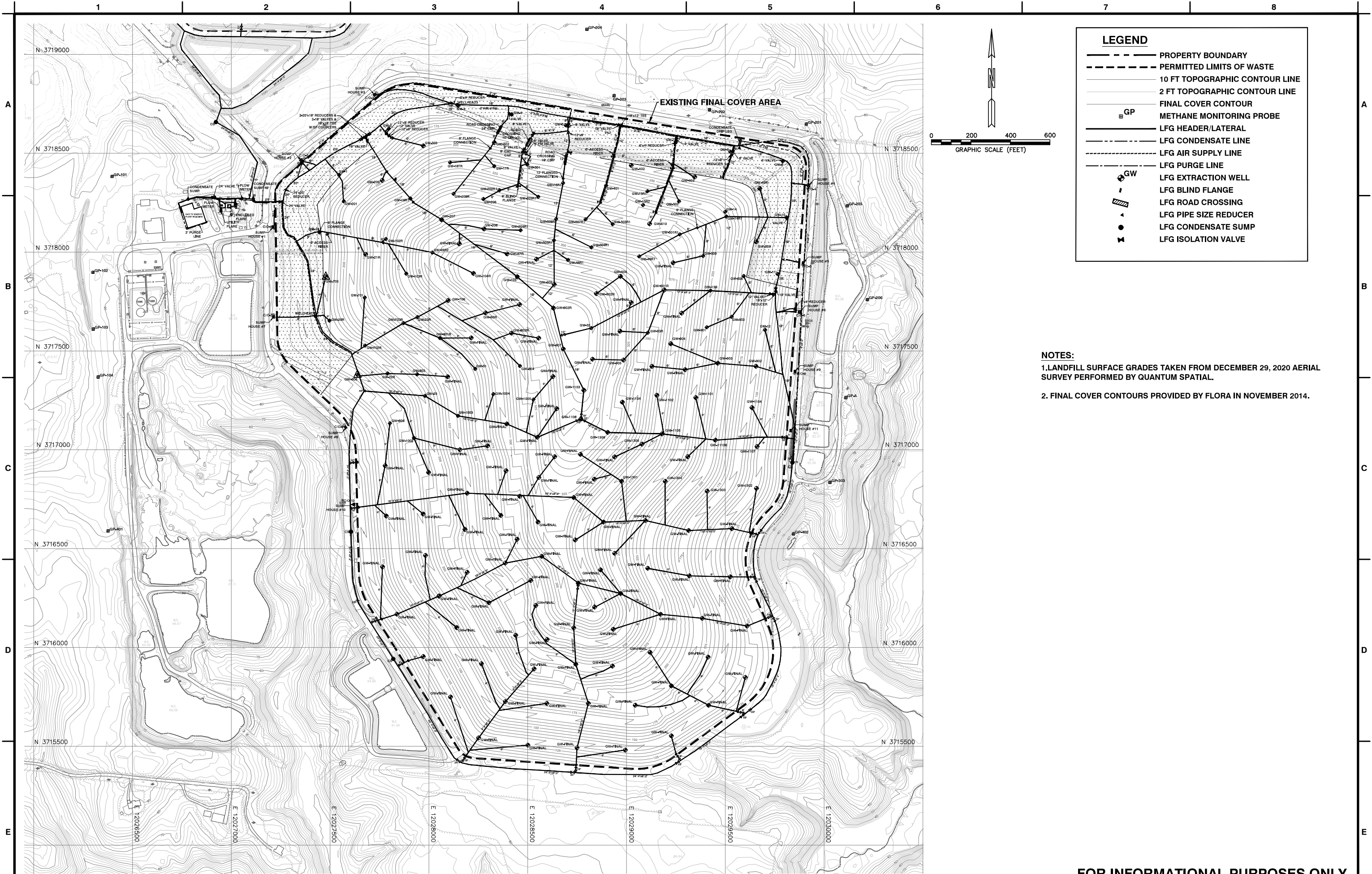
APPENDIX A
LANDFILL GAS MODELING RESULTS

TABLE 1. LFG RECOVERY PROJECTION
Middle Peninsula Landfill - Glenns, VA

Year	Disposal Rate	Refuse In-Place	Disposal Rate	Refuse In-Place	LFG Generation		
	(tons/yr)	(tons)	(Mg/yr)	(Mg)	(scfm)	(m³/min)	(Million ft³/yr)
1995	24,200	0	21,954	0	0	0.0	0
1996	266,527	24,200	241,789	21,954	12	0.3	6
1997	401,636	290,727	364,358	263,743	139	3.9	73
1998	459,455	692,363	416,811	628,101	326	9.2	172
1999	373,636	1,151,818	338,957	1,044,912	534	15.1	281
2000	436,364	1,525,454	395,863	1,383,869	693	19.6	364
2001	429,091	1,961,818	389,265	1,779,731	875	24.8	460
2002	494,627	2,390,909	448,718	2,168,996	1,046	29.6	550
2003	486,049	2,885,536	440,936	2,617,714	1,243	35.2	653
2004	517,450	3,371,585	469,423	3,058,650	1,427	40.4	750
2005	509,738	3,889,035	462,427	3,528,073	1,620	45.9	851
2006	484,127	4,398,773	439,193	3,990,500	1,801	51.0	947
2007	484,562	4,882,900	439,587	4,429,692	1,963	55.6	1,032
2008	530,129	5,367,462	480,925	4,869,279	2,118	60.0	1,113
2009	422,375	5,897,591	383,172	5,350,204	2,290	64.8	1,203
2010	323,692	6,319,966	293,648	5,733,376	2,403	68.0	1,263
2011	277,584	6,643,658	251,820	6,027,025	2,464	69.8	1,295
2012	354,177	6,921,242	321,304	6,278,845	2,500	70.8	1,314
2013	422,156	7,275,419	382,973	6,600,149	2,572	72.8	1,352
2014	404,089	7,697,575	366,583	6,983,122	2,674	75.7	1,406
2015	431,231	8,101,664	391,206	7,349,706	2,763	78.2	1,452
2016	506,766	8,532,895	459,730	7,740,912	2,862	81.0	1,504
2017	543,222	9,039,661	492,803	8,200,642	2,993	84.7	1,573
2018	546,141	9,582,883	495,451	8,693,445	3,136	88.8	1,648
2019	541,351	10,129,024	491,105	9,188,896	3,275	92.7	1,722
2020	528,133	10,670,375	479,114	9,680,001	3,407	96.5	1,791
2021	550,000	11,198,508	498,952	10,159,115	3,527	99.9	1,854
2022	550,000	11,748,508	498,952	10,658,067	3,652	103.4	1,920
2023	550,000	12,298,508	498,952	11,157,018	3,773	106.8	1,983
2024	550,000	12,848,508	498,952	11,655,970	3,889	110.1	2,044
2025	550,000	13,398,508	498,952	12,154,921	4,001	113.3	2,103
2026	550,000	13,948,508	498,952	12,653,873	4,108	116.3	2,159
2027	550,000	14,498,508	498,952	13,152,825	4,211	119.2	2,213
2028	550,000	15,048,508	498,952	13,651,776	4,310	122.0	2,265
2029	550,000	15,598,508	498,952	14,150,728	4,405	124.7	2,315
2030	550,000	16,148,508	498,952	14,649,679	4,496	127.3	2,363
2031	550,000	16,698,508	498,952	15,148,631	4,584	129.8	2,409
2032	550,000	17,248,508	498,952	15,647,583	4,668	132.2	2,453
2033	550,000	17,798,508	498,952	16,146,534	4,749	134.5	2,496
2034	550,000	18,348,508	498,952	16,645,486	4,827	136.7	2,537
2035	550,000	18,898,508	498,952	17,144,437	4,901	138.8	2,576
2036	550,000	19,448,508	498,952	17,643,389	4,973	140.8	2,614
2037	550,000	19,998,508	498,952	18,142,340	5,042	142.8	2,650
2038	550,000	20,548,508	498,952	18,641,292	5,108	144.7	2,685
2039	550,000	21,098,508	498,952	19,140,244	5,172	146.5	2,718
2040	550,000	21,648,508	498,952	19,639,195	5,233	148.2	2,751
2041	550,000	22,198,508	498,952	20,138,147	5,292	149.9	2,781
2042	550,000	22,748,508	498,952	20,637,098	5,348	151.5	2,811
2043	550,000	23,298,508	498,952	21,136,050	5,403	153.0	2,840
2044	550,000	23,848,508	498,952	21,635,002	5,455	154.5	2,867
2045	550,000	24,398,508	498,952	22,133,953	5,505	155.9	2,893
2046	550,000	24,948,508	498,952	22,632,905	5,553	157.2	2,919
2047	550,000	25,498,508	498,952	23,131,856	5,599	158.6	2,943
2048	550,000	26,048,508	498,952	23,630,808	5,644	159.8	2,966
2049	550,000	26,598,508	498,952	24,129,760	5,686	161.0	2,989
2050	550,000	27,148,508	498,952	24,628,711	5,727	162.2	3,010
2051	550,000	27,698,508	498,952	25,127,663	5,767	163.3	3,031
2052	550,000	28,248,508	498,952	25,626,614	5,805	164.4	3,051
2053	550,000	28,798,508	498,952	26,125,566	5,841	165.4	3,070
2054	550,000	29,348,508	498,952	26,624,517	5,876	166.4	3,088
2055	550,000	29,898,508	498,952	27,123,469	5,910	167.3	3,106
2056	550,000	30,448,508	498,952	27,622,421	5,942	168.3	3,123
2057	550,000	30,998,508	498,952	28,121,372	5,973	169.1	3,139
2058	550,000	31,548,508	498,952	28,620,324	6,003	170.0	3,155
2059	550,000	32,098,508	498,952	29,119,275	6,031	170.8	3,170
2060	550,000	32,648,508	498,952	29,618,227	6,059	171.6	3,185
2061	550,000	33,198,508	498,952	30,117,179	6,085	172.3	3,198
2062	550,000	33,748,508	498,952	30,616,130	6,111	173.0	3,212
2063	550,000	34,298,508	498,952	31,115,082	6,135	173.7	3,225
2064	550,000	34,848,508	498,952	31,614,033	6,158	174.4	3,237
2065	550,000	35,398,508	498,952	32,112,985	6,181	175.0	3,249
2066	550,000	35,948,508	498,952	32,611,936	6,203	175.6	3,260
2067	548,992	36,498,508	498,037	33,110,888	6,223	176.2	3,271
2068	0	37,047,500	0	33,608,925	6,243	176.8	3,281

Methane Content of LFG Adjusted to: 50%
 Selected Decay Rate Constant (k): 0.040
 Selected Ultimate Methane Recovery Rate (Lo): 100 m³/Mg = 3,204 cu ft/ton

APPENDIX B
GCCS DESIGN DRAWINGS



NOTES:
1. LANDFILL SURFACE GRADES TAKEN FROM DECEMBER 29, 2020 AERIAL SURVEY PERFORMED BY QUANTUM SPATIAL.
2. FINAL COVER CONTOURS PROVIDED BY FLORA IN NOVEMBER 2014.

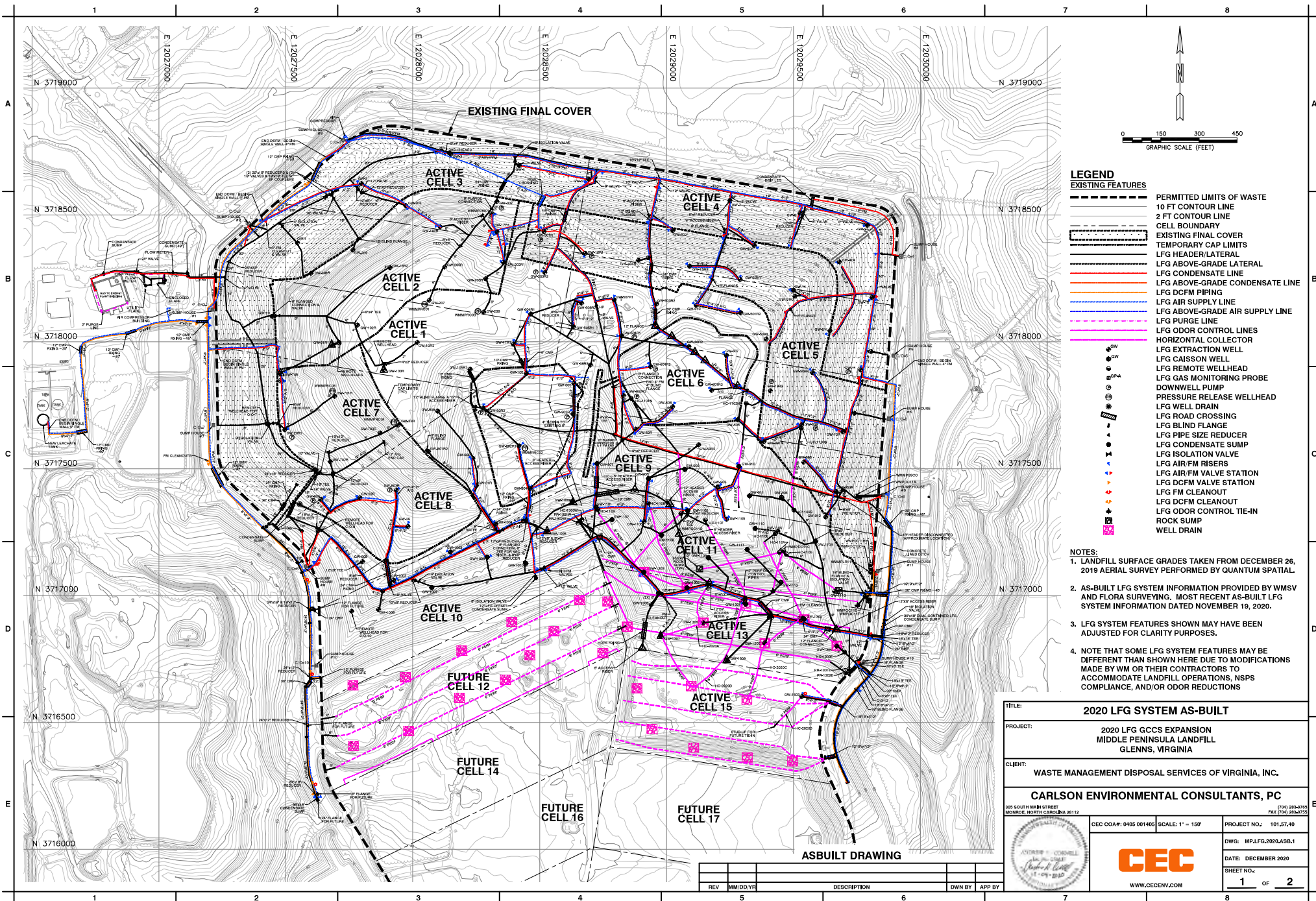
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CARLSON ENVIRONMENTAL CONSULTANTS, PC
305 SOUTH MAIN STREET
MONROE, NORTH CAROLINA 28112
(704) 283-9785 FAX (704) 283-9755

MAY 2021



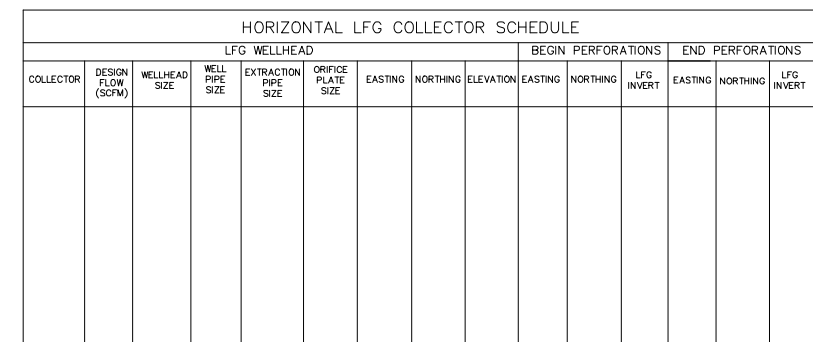
FINAL BUILDOUT PLAN
MIDDLE PENINSULA LANDFILL



- LEGEND**
EXISTING FEATURES
- PERMITTED LIMITS OF WASTE
 - 10 FT CONTOUR LINE
 - 2 FT CONTOUR LINE
 - CELL BOUNDARY
 - EXISTING FINAL COVER
 - TEMPORARY CAP LIMITS
 - LFG HEADER/LATERAL
 - LFG ABOVE-GRADE LATERAL
 - LFG CONDENSATE LINE
 - LFG ABOVE-GRADE CONDENSATE LINE
 - LFG DCFM PIPING
 - LFG AIR SUPPLY LINE
 - LFG ABOVE-GRADE AIR SUPPLY LINE
 - LFG PURGE LINE
 - LFG ODOR CONTROL LINES
 - HORIZONTAL COLLECTOR
 - LFG EXTRACTION WELL
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 - LFG REMOTE WELLHEAD
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 - PRESSURE RELEASE WELLHEAD
 - LFG WELL DRAIN
 - LFG ROAD CROSSING
 - LFG BLIND FLANGE
 - LFG PIPE SIZE REDUCER
 - LFG CONDENSATE SUMP
 - LFG ISOLATION VALVE
 - LFG AIR/FM RISERS
 - LFG AIR/FM VALVE STATION
 - LFG DCFM VALVE STATION
 - LFG FM CLEANOUT
 - LFG DCFM CLEANOUT
 - LFG ODOR CONTROL TIE-IN
 - ROCK SUMP
 - WELL DRAIN

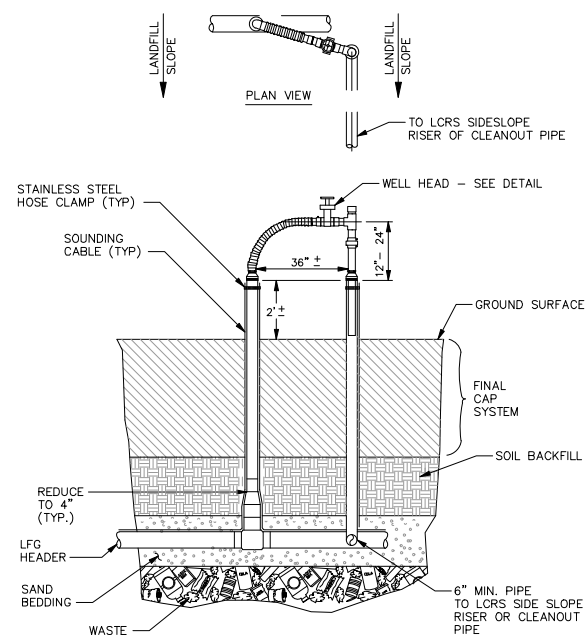
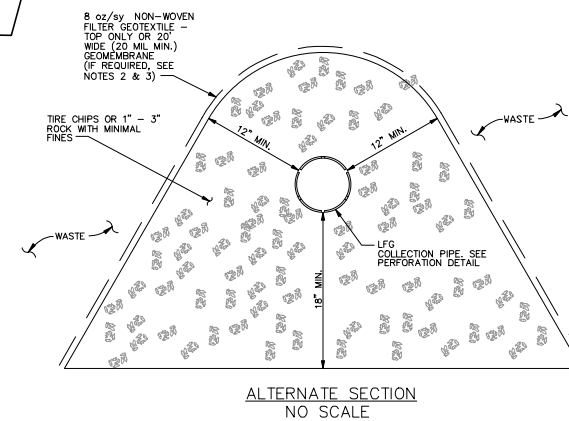
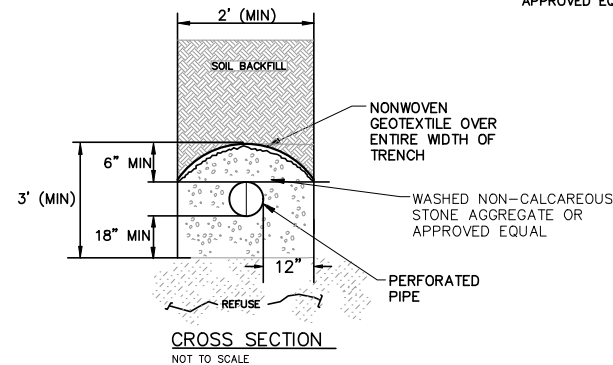
- NOTES:**
1. LANDFILL SURFACE GRADES TAKEN FROM DECEMBER 26, 2019 AERIAL SURVEY PERFORMED BY QUANTUM SPATIAL.
 2. AS-BUILT LFG SYSTEM INFORMATION PROVIDED BY WMSV AND FLORA SURVEYING. MOST RECENT AS-BUILT LFG SYSTEM INFORMATION DATED NOVEMBER 19, 2020.
 3. LFG SYSTEM FEATURES SHOWN MAY HAVE BEEN ADJUSTED FOR CLARITY PURPOSES.
 4. NOTE THAT SOME LFG SYSTEM FEATURES MAY BE DIFFERENT THAN SHOWN HERE DUE TO MODIFICATIONS MADE BY WM OR THEIR CONTRACTORS TO ACCOMMODATE LANDFILL OPERATIONS, NSPS COMPLIANCE, AND/OR ODOR REDUCTIONS

TITLE:		2020 LFG SYSTEM AS-BUILT	
PROJECT:		2020 LFG GCCS EXPANSION MIDDLE PENINSULA LANDFILL GLENN, VIRGINIA	
CLIENT:		WASTE MANAGEMENT DISPOSAL SERVICES OF VIRGINIA, INC.	
CONSULTANT:		CARLSON ENVIRONMENTAL CONSULTANTS, PC 300 SOUTH MAIN STREET MOHORE, NORTH CAROLINA 28112 (704) 293-6771 FAX (704) 293-6775	
CEC COAF: 0405 001405	SCALE: 1" = 150'	PROJECT NO.:	101,57,40
DWG: MP.LFG.2020.ASB.1		DATE:	DECEMBER 2020
SHEET NO.:		1	OF 2
WWW.CECENV.COM			

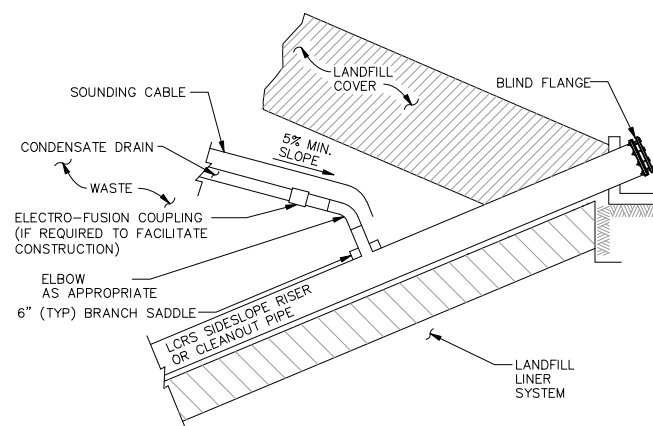


PERFORATED PIPE DETAIL

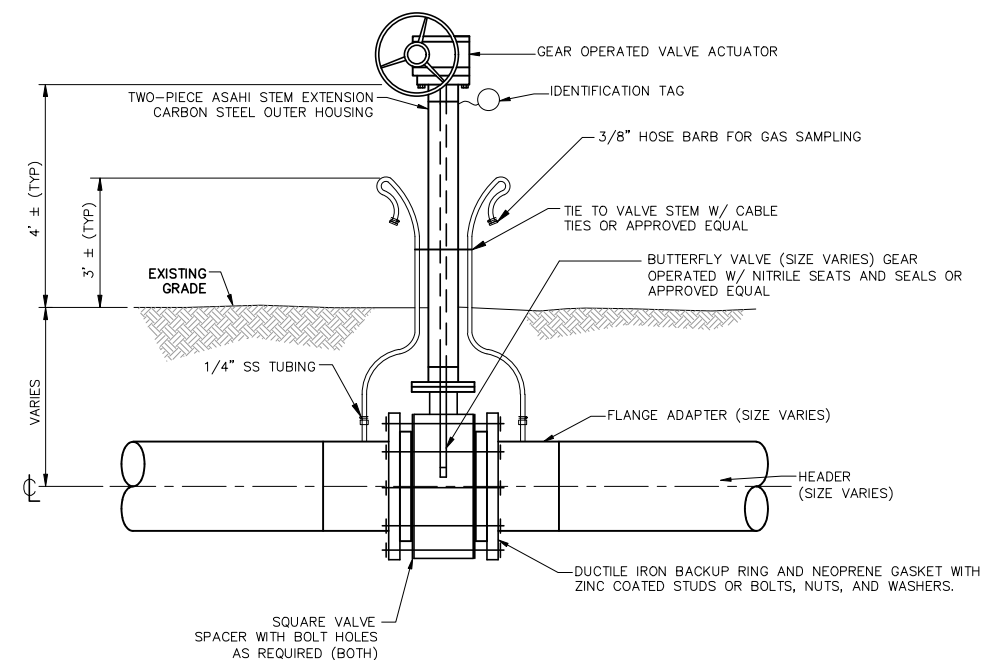
NOT TO SCALE



TYPICAL LCRS LFG COLLECTOR AT HEADER PIPE



TYPICAL LCRS LFG COLLECTOR AT SIDESLOPE RISER OR CLEANOUT



TYPICAL ISOLATION VALVE
NO SCALE

NOTES FOR HEADER VALVES:

1. CONTRACTOR TO WRAP ALL BURIED VALVES IN 5-MIL PLASTIC SHEETING AND DUCT TAPE TO SEAL OUT DIRT, WATER, AND DEBRIS.
2. CONTRACTOR TO INSTALL ALL VALVES STRAIGHT AND PLUMB.

[illegible]

TYPICAL GCCS DETAILS

**WASTE MANAGEMENT
OF VIRGINIA, INC.
3714 WASTE MANAGEMENT WAY
GLENN, VA 23149**

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
11260 ROGER BACON DRIVE - RESTON, VA 20190
TELEPHONE: (703) 471-6150 FAX: (703) 471-6676

INC. BY:	DWN. BY:	Q/A R/W BY:
NO. 2018.00	CHK. BY:	APP. BY:

ADD FILE:	WM Details
DATE:	07/2021
SCALE:	AS NOTED
DRAWING NO.	

APPENDIX C
SURFACE EMISSIONS MONITORING PLAN

LANDFILL SURFACE EMISSIONS MONITORING PLAN

This surface emission monitoring plan is prepared in accordance with the requirements of §60.34f(d)/§63.1958(d)(1). Please also note related proposed alternatives and clarifications in Section 6 and Section 7, respectively.

Sampling Methods and Procedures

In accordance with NESHAP AAAA and EG Cf, a surface methane concentration below 500 parts per million (ppm) above background is established as the GCCS operational standard.

Surface emissions monitoring (SEM) will be performed quarterly on a calendar basis. If no SEM exceedances are recorded at any location for three consecutive quarterly monitoring events in portions/areas of the landfill that are closed or at final grade, monitoring will be performed annually in the areas/portions that are closed or at final grade. Refer to the proposed alternative in Section 6 regarding SEM for closed portions of the landfill.

If any methane reading of 500 ppm or more above background is detected during the annual surface emissions monitoring event, the landfill will return to quarterly monitoring of the closed/final grade portions/area in which the exceedance was recorded.

The following methods and procedures for surface emissions testing have been developed to satisfy the requirements of §60.34f(d)/§63.1958(d)(1).

- A portable monitor in general conformance with 40 CFR Part 60, Appendix A, Method 21 will be used to determine the methane concentration at each sampling point. The instrument will be calibrated, per the manufacturer's recommendations, for methane, diluted to a nominal concentration of 500 ppm in air.
- The background concentration will be determined by moving the probe inlet upwind and downwind outside the refuse permit boundary of the landfill at a distance of at least 30 meters (approximately 98 feet).
- Monitoring will be performed during typical meteorological conditions.
- The detector probe will be positioned within 2 to 4 inches (5 to 10 centimeters) of the ground.
- Monitoring will be conducted in those areas of the landfill subject to the control requirements of NESHAP AAAA and EG Cf (5 year/2 year rule for waste age and area closure status).
- Monitoring will be conducted around the perimeter of the collection area and along a pattern that traverses the landfill at no more than 30-meter (approximately 98-foot) intervals and where visual observations indicate elevated

concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover.

- Monitoring will be conducted at cover penetrations as defined in NESHAP AAAA.
- Areas with steep slopes or other dangerous areas will be excluded from the surface monitoring. See also Section 7.

A map showing the current SEM monitoring route is provided in Appendix C.

Leachate Riser Pipes and Cleanouts

Pursuant to an Administrative Consent Order (ACO) with EPA Region III (ACO #CAA-03-2005-02-DA), the landfill will also conduct methane surface monitoring at visible features of cleanout pipes, risers, pump/sump houses associated with the leachate collection and control systems that penetrate the landfill surface within the perimeter of waste disposal area and within the area for which a GCCS is required per §60.753(a). This monitoring shall be conducted at reasonable proximity to, but no more than 12 inches from, these features.

Where such leachate riser pipes or cleanouts penetrate the landfill surface directly into a pump house/sump house located, at least in part, both within the perimeter of the waste disposal area and within an area for which a GCCS is required per §60.753(a), monitoring shall be conducted at reasonable proximity to, but no more than 12 inches from, such pump house/sump house. Additionally, monitoring conducted in accordance with this paragraph shall also be performed with the SEM probe inlet between 5 to 10 centimeters (2 to 4 inches) from the ground and in accordance with EPA Method 21, Section 8.3.1.

Recordkeeping and Correction Actions

Any detection of 500 ppm or more above background will be recorded as an exceedance.

- The location of each monitored exceedance will be marked and the location and concentration will be recorded.
- The latitude and longitude coordinates of each surface emissions exceedance will be recorded with an instrument accuracy of at least 4 meters. The coordinates will be in decimal degrees with at least five decimal places.
- The location and concentration of each exceedance recorded during the surface emissions monitoring will be reported in the semi-annual reports. The concentration recorded at each location for which an exceedance was recorded in the previous month will also be included in the semi-annual reports.

Pursuant to EG Cf, NESHAP AAAA and the ACO, corrective actions shall be taken, which may include one or more of the following:

- The cover in the vicinity shall be examined and maintenance activities will be initiated.
- An attempt will be made to seal visible sources of LFG at the exceedance location.
- If the leachate system is connected to the GCCS, adjustments will be made to the vacuum level, as necessary and appropriate based on leachate management considerations. Adjustments to the vacuum imposed on the leachate management system are not appropriate if, based on good engineering practice, the vacuum adjustment would be expected to interfere with effective leachate management. See also Section 6.
- Adjustments to the GCCS, and/or relevant supplemental collectors, will be initiated as necessary and appropriate based on other LFG management considerations.

Following corrective action, the location shall be re-monitored in accordance with the procedures and timelines of §60.36f(c)(4) and §63.1960(c)(4). If a second exceedance is identified during a quarterly re-monitoring event, additional corrective action shall be taken and the location again re-monitored in accordance with the procedures and timelines of §60.36f(c)(4) and §63.1960(c)(4) .

If a third exceedance of the 500 ppmv (above background) level is identified for the quarter, then one of the following response actions shall be performed pursuant to EG Cf, NESHAP AAAA and the ACO:

- An additional well or collection device shall be installed in the vicinity of the exceedance within 120 calendar days of the initial exceedance; or
- Initiate an alternate remedy, such as upgrading the blower, header piping, treatment/control system, or installing dewatering equipment. See also Section 6. An alternate remedy and timeline shall be submitted to the VDEQ for approval in accordance with 40 CFR §60.755(c)(4)(v); or
- If the exceedance is measured within 12 inches of a cleanout pipe, riser, or pump house/sump house associated with the leachate collection system, and such leachate collection system is not then under control of a vacuum system, then the vacuum system shall be extended to such cleanout pipe, riser, or pump house/sump house associated with the leachate collection system; or
- If the leachate system associated with any cleanout pipes, risers, and pump houses/sump houses is not then under control of a vacuum system, then the leachate system shall be subjected to vacuum control likely to reduce the measured surface methane concentration in the vicinity of the relevant cleanout pipe, riser, or pump house/sump house to less than 500 ppm above background, and to the further extent that such application of vacuum is consistent with appropriate leachate management considerations.

Pursuant to the ACO, the landfill shall be obligated to institute one of the four response actions listed above, only to the extent that response actions otherwise initiated by the landfill, including any other corrective actions listed above did not succeed in reducing the measured surface methane concentration at the relevant location to less than 500 ppmv above background.

Further, pursuant to the ACO, if it is determined that any above response action is not reasonable likely to reduce the measured surface methane concentration at the relevant location to less than 500 ppm above background, or that such response action is inconsistent with overall landfill gas GCCS considerations or appropriate and effective leachate management considerations, then the landfill is not obligated to institute such response action. In this case, the landfill shall prepare a written demonstration in support of such a determination and submit this demonstration by certified mail, first class mail, facsimile or reputable courier to:

Chief, Air Enforcement Branch
United States Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

If, after review of the landfill's notice and written demonstration, and after consultation with the landfill, EPA Region III determines that the landfill's demonstration is inadequate to justify its proposal to perform no corrective action in response to the relevant monitoring event, then the EPA Region III may either request additional information from the landfill or provide written notice to the landfill of the EPA Region III's determination.

In the event that the landfill receives any such notice of determination from EPA Region III, then the landfill will implement the corrective measures in response to the relevant monitoring event in accordance with the provisions of the ACO. The landfill's failure to have instituted any corrective action in response to the relevant monitoring event prior to the date ten (10) days after the date of the landfill's receipt of EPA Region III's notice of determination made in accordance with this paragraph shall not constitute noncompliance with the ACO or the provisions of the landfill NSPS.

In the event that the ACO is terminated or no longer applies, those requirements outlined herein which are applicable pursuant to the ACO solely will no longer apply and SEM monitoring will be in strict accordance with the requirements of EG Cf and NESHAP AAAA.

SURFACE EMISSIONS MONITORING PLANS

MIDDLE PENINSULA LANDFILL

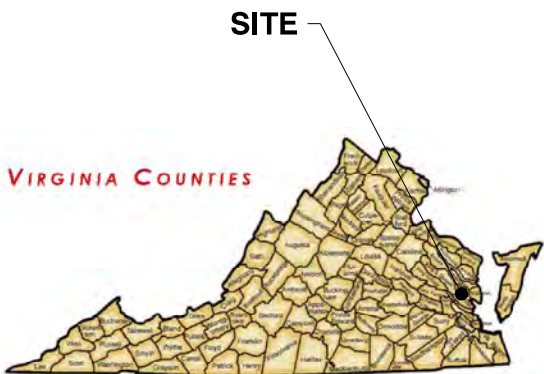
GLENNS, VIRGINIA



OWNER:
WASTE MANAGEMENT SERVICES OF VIRGINIA, INC.
MIDDLE PENINSULA LANDFILL
3714 WASTE MANAGEMENT WAY
GLENNS, VA 23149
(804) 693-5109

OWNER REPRESENTATIVE:
MICHAEL EASTER
(804) 664-3859

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	EXISTING GCCS SITE PLAN
3	SEM ROUTE
4	SEM PENETRATION MAP



AREA MAP
SCALE: AS SHOWN

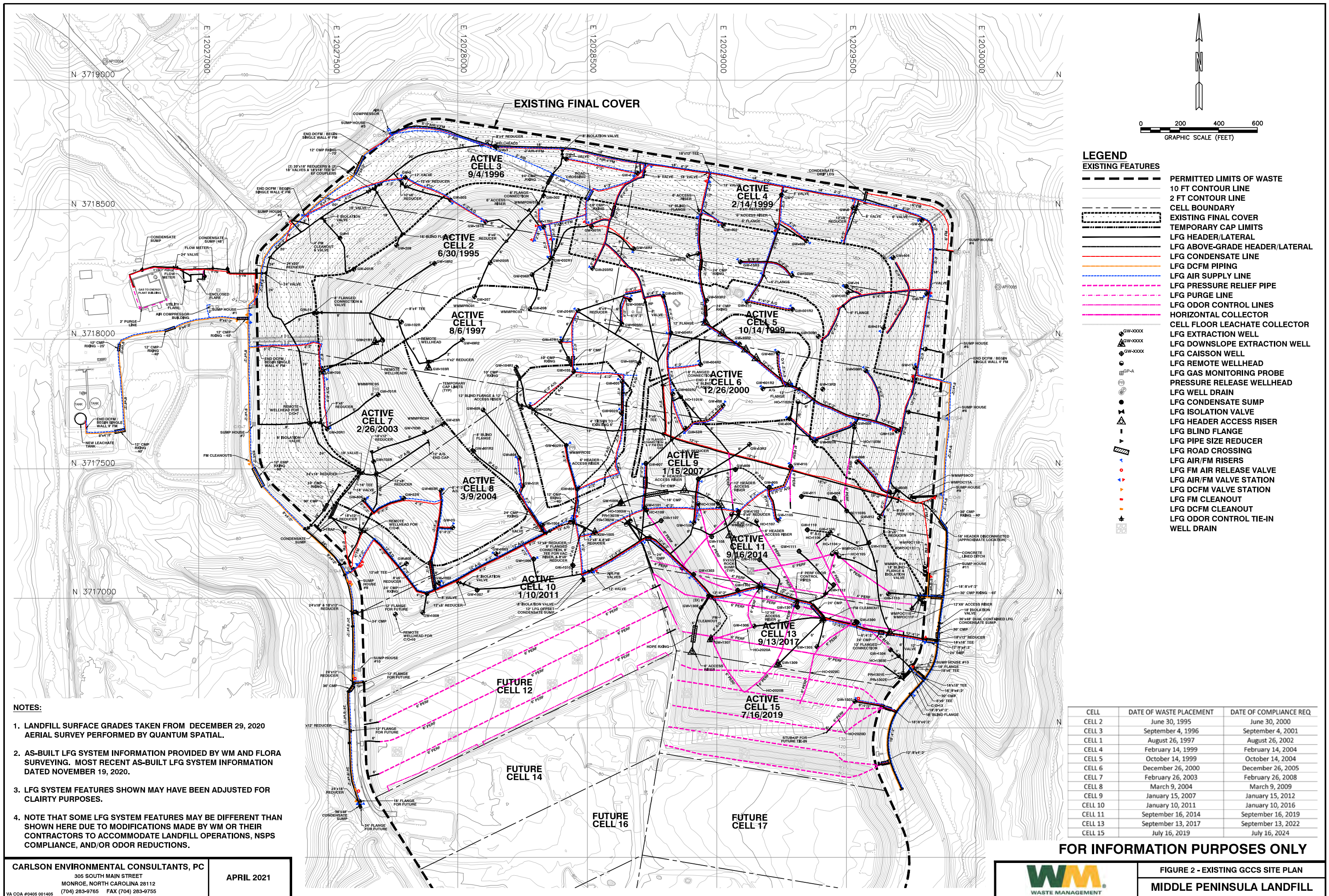


ENGINEER:
CARLSON ENVIRONMENTAL CONSULTANTS, PC
305 SOUTH MAIN STREET
MONROE, NORTH CAROLINA 28112
(704) 283-9765

CEC JOB NO. 101.57.45

APRIL 2021

FOR INFORMATION PURPOSES ONLY



NOTES:

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LEGEND
EXISTING FEATURES

- 10 FT CONTOUR LINE
- 2 FT CONTOUR LINE
- CELL BOUNDARY
- EXISTING FINAL COVER
- TEMPORARY CAP LIMITS
- LFG HEADER/LATERAL
- LFG ABOVE-GRADE HEADER/LATERAL
- LFG CONDENSATE LINE
- LFG DCFM PIPING
- LFG AIR SUPPLY LINE
- LFG PRESSURE RELIEF PIPE
- LFG PURGE LINE
- LFG ODOR CONTROL LINES
- HORIZONTAL COLLECTOR
- CELL FLOOR LEACHATE COLLECTOR
- LFG EXTRACTION WELL
- LFG DOWNSLOPE EXTRACTION WELL
- LFG CAISSON WELL
- LFG REMOTE WELLHEAD
- LFG GAS MONITORING PROBE
- PRESSURE RELEASE WELLHEAD
- LFG WELL DRAIN
- LFG CONDENSATE SUMP
- LFG ISOLATION VALVE
- LFG HEADER ACCESS RISER
- LFG BLIND FLANGE
- LFG PIPE SIZE REDUCER
- LFG ROAD CROSSING
- LFG AIR/FM RISERS
- LFG FM AIR RELEASE VALVE
- LFG AIR/FM VALVE STATION
- LFG DCFM VALVE STATION
- LFG FM CLEANOUT
- LFG DCFM CLEANOUT
- LFG ODOR CONTROL TIE-IN
- WELL DRAIN

CELL	DATE OF WASTE PLACEMENT	DATE OF COMPLIANCE REQ.
CELL 2	June 30, 1995	June 30, 2000
CELL 3	September 4, 1996	September 4, 2001
CELL 1	August 26, 1997	August 26, 2002
CELL 4	February 14, 1999	February 14, 2004
CELL 5	October 14, 1999	October 14, 2004
CELL 6	December 26, 2000	December 26, 2005
CELL 7	February 26, 2003	February 26, 2008
CELL 8	March 9, 2004	March 9, 2009
CELL 9	January 15, 2007	January 15, 2012
CELL 10	January 10, 2011	January 10, 2016
CELL 11	September 16, 2014	September 16, 2019
CELL 13	September 13, 2017	September 13, 2022
CELL 15	July 16, 2019	July 16, 2024

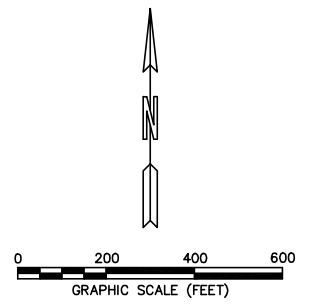
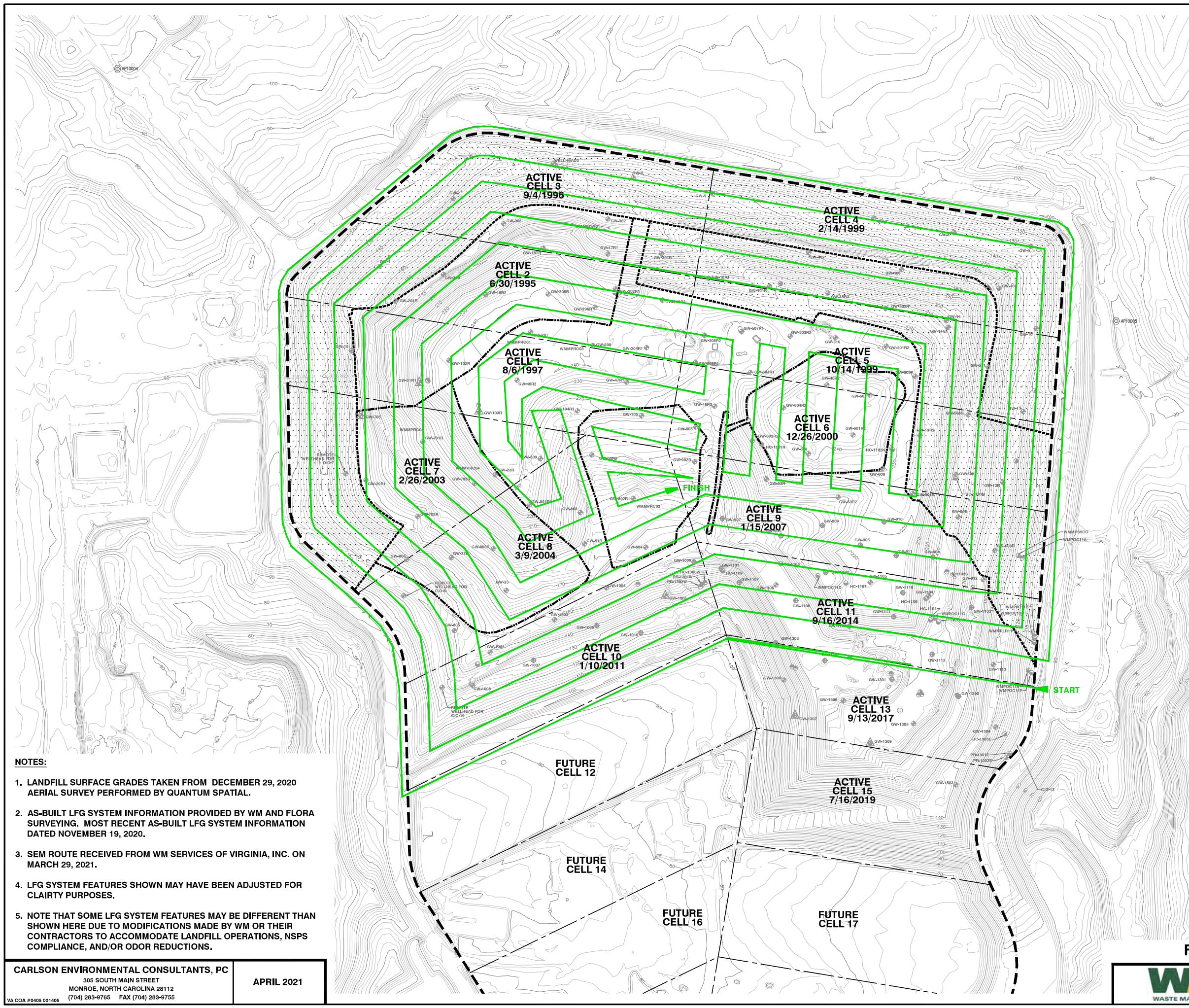
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MONROE, NORTH CAROLINA 28112
(704) 283-9765 FAX (704) 283-9755

APRIL 2021



FIGURE 2 - EXISTING GCCS SITE PLAN
MIDDLE PENINSULA LANDFILL



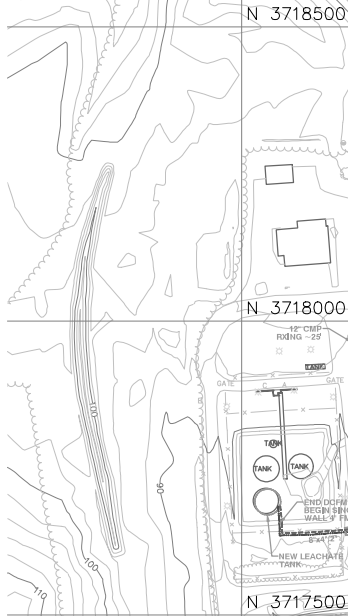
- LEGEND**
- EXISTING FEATURES**
- PERMITTED LIMITS OF WASTE
 - 10 FT CONTOUR LINE
 - 2 FT CONTOUR LINE
 - CELL BOUNDARY
 - EXISTING FINAL COVER
 - TEMPORARY CAP LIMITS
 - SEM ROUTE
 - LFG EXTRACTION WELL
 - LFG DOWNSLOPE EXTRACTION WELL
 - LFG CAISSON WELL
 - LFG REMOTE WELLHEAD
 - LFG GAS MONITORING PROBE
 - PRESSURE RELEASE WELLHEAD
 - LFG WELL DRAIN

- NOTES:**
1. LANDFILL SURFACE GRADES TAKEN FROM DECEMBER 29, 2020 AERIAL SURVEY PERFORMED BY QUANTUM SPATIAL.
 2. AS-BUILT LFG SYSTEM INFORMATION PROVIDED BY WM AND FLORA SURVEYING. MOST RECENT AS-BUILT LFG SYSTEM INFORMATION DATED NOVEMBER 19, 2020.
 3. SEM ROUTE RECEIVED FROM WM SERVICES OF VIRGINIA, INC. ON MARCH 29, 2021.
 4. LFG SYSTEM FEATURES SHOWN MAY HAVE BEEN ADJUSTED FOR CLAIRTY PURPOSES.
 5. NOTE THAT SOME LFG SYSTEM FEATURES MAY BE DIFFERENT THAN SHOWN HERE DUE TO MODIFICATIONS MADE BY WM OR THEIR CONTRACTORS TO ACCOMMODATE LANDFILL OPERATIONS, NSPS COMPLIANCE, AND/OR ODOR REDUCTIONS.

CELL	DATE OF WASTE PLACEMENT	DATE OF COMPLIANCE REQ
CELL 2	June 30, 1995	June 30, 2000
CELL 3	September 4, 1996	September 4, 2001
CELL 1	August 26, 1997	August 26, 2002
CELL 4	February 14, 1999	February 14, 2004
CELL 5	October 14, 1999	October 14, 2004
CELL 6	December 26, 2000	December 26, 2005
CELL 7	February 26, 2003	February 26, 2008
CELL 8	March 9, 2004	March 9, 2009
CELL 9	January 15, 2007	January 15, 2012
CELL 10	January 10, 2011	January 10, 2016
CELL 11	September 16, 2014	September 16, 2019
CELL 13	September 13, 2017	September 13, 2022
CELL 15	July 16, 2019	July 16, 2024

FOR INFORMATION PURPOSES ONLY

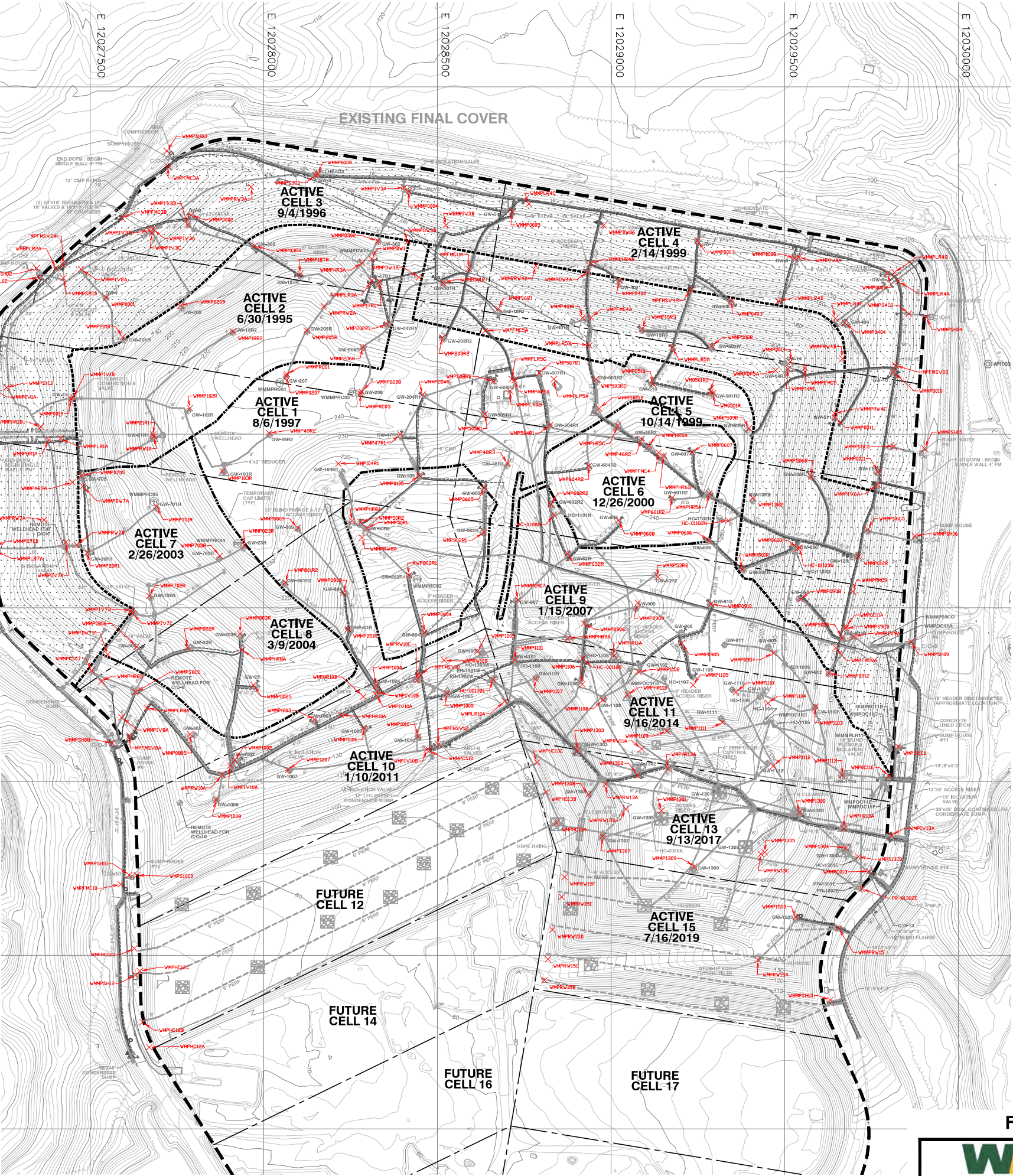
DEVICE ABBREVIATION	ABBREVIATION DESCRIPTION
AR	AIR RISER
ASV	AIR SHUT OFF VALVE
CO	CLEANOUT RISER
CS	CONDENSATE SUMP
DP	DRAINAGE PIPE
DW	DEWATERING WELL
FL	FLARE LINE
FMC	FORCEMAIN CLEANOUT
FMSV	FORCEMAIN SHUTOFF VALVE
HC	HORIZONTAL RISER
HR	HEADER RISER
IV	ISOLATION VALVE
LCR	LEACHATE CLEANOUT RISER
LP	LEACHATE PIT
LR	LEACHATE RISER
PR	PRESSURE RELIEF PIPE RISER
RC	RIBBON COLLECTOR
RW	REMOTE WELL
SHC#	SUMP HOUSE RISER/CLEANOUT
SH	SUMP HOUSE



- NOTES:**
1. LANDFILL SURFACE GRADES TAKEN FROM DECEMBER 29, 2020 AERIAL SURVEY PERFORMED BY QUANTUM SPATIAL.
 2. AS-BUILT LFG SYSTEM INFORMATION PROVIDED BY WM AND FLORA SURVEYING. MOST RECENT AS-BUILT LFG SYSTEM INFORMATION DATED NOVEMBER 19, 2020.
 3. LFG SYSTEM FEATURES SHOWN MAY HAVE BEEN ADJUSTED FOR CLAIRTY PURPOSES.
 4. NOTE THAT SOME LFG SYSTEM FEATURES MAY BE DIFFERENT THAN SHOWN HERE DUE TO MODIFICATIONS MADE BY WM OR THEIR CONTRACTORS TO ACCOMMODATE LANDFILL OPERATIONS, NSPS COMPLIANCE, AND/OR ODOR REDUCTIONS.
 5. PENETRATION INVENTORY COMPLETED MARCH 23-26, 2021 REPRESENTS THE EXISTING SITE CONDITIONS ON THOSE DAYS.
 6. FOR THE PURPOSE OF THE PENETRATION MAPPING, A PENETRATION IS BEING DEFINED PER 40 CFR 63.1990 (AAAA), "A COVER PENETRATION MEANS A WELLHEAD, A PART OF A LANDFILL GAS COLLECTION OR OPERATIONS SYSTEM, AND/OR ANY OTHER OBJECT THAT COMPLETELY PASSES THROUGH THE LANDFILL COVER. THE LANDFILL COVER INCLUDES THAT PORTION WHICH COVERS THE WASTE, AS WELL AS THE PORTION WHICH BORDERS THE WASTE EXTENDED TO THE POINT WHERE IT IS SEALED WITH THE LANDFILL LINER OR THE SURROUNDING LAND MASS. EXAMPLES OF WHAT IS NOT A PENETRATION FOR THE PURPOSE OF THIS SUBPART INCLUDE BUT ARE NOT LIMITED TO: SURVEY STAKES, FENCING INCLUDING LITTER FENCES, FLAGS, SIGNS, UTILITY POSTS, AND TREES SO LONG AS THESE ITEMS DO NOT PASS THROUGH THE LANDFILL COVER."

CARLSON ENVIRONMENTAL CONSULTANTS, PC
305 SOUTH MAIN STREET
MONROE, NORTH CAROLINA 28112
(704) 283-9765 FAX (704) 283-9755

APRIL 2021



- LEGEND**
- EXISTING FEATURES**
- 10 FT CONTOUR LINE
 - 2 FT CONTOUR LINE
 - CELL BOUNDARY
 - EXISTING FINAL COVER
 - TEMPORARY CAP LIMITS
 - LFG HEADER/LATERAL
 - LFG ABOVE-GRADE HEADER/LATERAL
 - LFG CONDENSATE LINE
 - LFG DCFM PIPING
 - LFG AIR SUPPLY LINE
 - LFG PRESSURE RELIEF PIPE
 - LFG PURGE LINE
 - LFG ODOR CONTROL LINES
 - HORIZONTAL COLLECTOR
 - CELL FLOOR LEACHATE COLLECTOR
 - LFG EXTRACTION WELL
 - LFG DOWNSLOPE EXTRACTION WELL
 - LFG CAISSON WELL
 - LFG REMOTE WELLHEAD
 - LFG GAS MONITORING PROBE
 - PRESSURE RELEASE WELLHEAD
 - LFG WELL DRAIN
 - LFG CONDENSATE SUMP
 - LFG ISOLATION VALVE
 - LFG HEADER ACCESS RISER
 - LFG BLIND FLANGE
 - LFG PIPE SIZE REDUCER
 - LFG ROAD CROSSING
 - LFG AIR/FM RISERS
 - LFG FM AIR RELEASE VALVE
 - LFG AIR/FM VALVE STATION
 - LFG DCFM VALVE STATION
 - LFG FM CLEANOUT
 - LFG DCFM CLEANOUT
 - LFG ODOR CONTROL TIE-IN
 - WELL DRAIN
 - PENETRATION POINT

CELL	DATE OF WASTE PLACEMENT	DATE OF COMPLIANCE REQ.
CELL 2	June 30, 1995	June 30, 2000
CELL 3	September 4, 1996	September 4, 2001
CELL 1	August 26, 1997	August 26, 2002
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CELL 5	October 14, 1999	October 14, 2004
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CELL 9	January 15, 2007	January 15, 2012
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CELL 11	September 16, 2014	September 16, 2019
CELL 13	September 13, 2017	September 13, 2022
CELL 15	July 16, 2019	July 16, 2024

FOR INFORMATION PURPOSES ONLY



FIGURE 4 - SEM PENETRATION MAP
MIDDLE PENINSULA LANDFILL

APPENDIX D

AGENCY CORRESPONDENCE, DETERMINATIONS, APPROVAL LETTERS

APR 4 2013



COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

PIEDMONT REGIONAL OFFICE

4949-A Cox Road, Glen Allen, Virginia 23060

(804) 527-5020 Fax (804) 527-5106

www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

Michael P. Murphy
Regional Director

March 27, 2013

Mr. H. Scott Thacker
Director of Disposal Operations
Waste Management Disposal Services of Virginia, Inc.
Middle Peninsula Landfill and Recycling Facility
3714 Waste Management Way
Glenns, VA 23149

Location: Gloucester County
Registration No: 40920
AIRS ID No: 51-007-0010

Dear Mr. Thacker:

This letter acknowledges receipt of your GCCS Design Plan submittal to this office on March 30, 2012 and clarification letter dated March 15, 2013. The Piedmont Regional Office of the Department of Environmental Quality, (DEQ-PRO) has completed its review of the GCCS Design Plan for your facility located in Gloucester County, Virginia. The ten approved alternatives are acceptable. In accordance with the requirements of 40 CFR Part 60, Subpart WWW, the amended GCCS Design Plan is approved with comments attached by the Piedmont Regional Office of the Department of Environmental Quality, (DEQ-PRO).

The approval of the Landfill Gas Collection and Control System (GCCS) Design Plan does not relieve the owner of the responsibility of operating the facility in a consistent manner to meet the facility performance requirements or the responsibility for the correction of design and/or operational deficiencies. Nor does this approval relieve the owner from meeting permit requirements and all other applicable laws and regulations.

If you have any questions, please call "Sparky" H.L. Lisle, Jr. at 804-527-5148.

Sincerely,

A handwritten signature in blue ink, appearing to read "J. E. Kyle", is written over the typed name and title.

James E. Kyle, P.E.
Air Permits Manager

JEK/hll/40920_7_WWWDesignPlanFinalApproval03272013.docx

APPENDIX E
VDEQ DOCUMENT CERTIFICATION

DOCUMENT CERTIFICATION

Facility Name: Middle Peninsula Landfill and Recycling Facility

Registration No. 40920

Facility Location: 3714 Waste Management Way, Glenns, VA.

Type of Submittal Attached: Landfill Gas Collection and Control System Design
Plan (2021)

Certification: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering and evaluating the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name of Responsible Official (Print): Mr. Harold Thacker

Title: Area Director of Disposal Operations

Signature:  **Date:** 7/28/2021



Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

PIEDMONT REGIONAL OFFICE
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www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director
(804) 698-4000

James J. Golden
Regional Director

February 4, 2020

Mr. Harold S. Thacker
Director of Operations
Waste Management Disposal Services of Virginia, Inc.
Middle Peninsula Landfill and Recycling Facility
3714 Waste Management Way
Glenns, VA 23149

Location: Gloucester County
Registration No: 40920

Dear Mr. Thacker:

Attached is a renewal permit to operate your municipal waste landfill pursuant to 9 VAC 5 Chapter 80 of the Virginia Regulations for the Control and Abatement of Air Pollution. This permit incorporates provisions from the permit dated August 7, 2017.

The permit contains legally enforceable conditions. Failure to comply may result in a Notice of Violation and civil penalty. Please read all permit conditions carefully.

In evaluating the application and arriving at a final decision to issue this permit, the Department deemed the application complete on December 18, 2019. Solicited written public comments by placing a newspaper advertisement in the Gloucester-Mathews Gazette-Journal newspaper on October 17, 2019. The thirty (30) day comment period (provided for in 9 VAC 5-80-270) expired on November 16, 2019. No comments were received from the public. All comments received in this office from the US EPA were resolved and a detailed account attached to the statement of Basis (SOB).

This approval to operate does not relieve Waste Management Disposal Services of Virginia, Inc. of the responsibility to comply with all other local, state, and federal permit regulations.

To review any federal rules referenced in the attached permit, the US Government Publishing Office maintains the text of these rules at www.ecfr.gov, Title 40, Part 60 and/or 63.

The Board's Regulations as contained in Title 9 of the Virginia Administrative Code 5-170-200 provide that you may request a formal hearing from this case decision by filing a petition with the Board within 30 days after this case decision notice was mailed or delivered to you. Please consult the relevant regulations for additional requirements for such requests.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date you actually received this permit or the date on which it was mailed to you, whichever occurred first, within which to initiate an appeal of this decision by filing a Notice of Appeal with:

David K. Paylor, Director
Department of Environmental Quality
P.O. Box 1105
Richmond, VA 23218-1105

If this permit was delivered to you by mail, three days are added to the thirty-day period in which to file an appeal. Please refer to Part Two A of the Rules of the Supreme Court of Virginia for information on the required content of the Notice of Appeal and for additional requirements governing appeals from decisions of administrative agencies.

If you have any questions concerning this permit, please call 804-527-5020.

Sincerely,



James E. Kyle, P.E.
Air Permit Manager

JEK/hll/ 40920_Title_V_Cover_Letter_ADA_02042020_Final

Attachment: Permit
67 FR 36476 (May 23, 2002 – NSPS WWW Clarification)
71 FR 53272 (September 8, 2006 – NSPS WWW/NESHAP AAAA Clarification)
DEQ Forms Link: (<http://www.deq.virginia.gov/Programs/Air/Forms.aspx>)
Air Compliance Forms: ACC, PDR and SAMR Templates
Federal Rules Link (www.ecfr.gov):
40 CFR 60 Subpart WWW
40 CFR 63 Subpart AAAA
40 CFR 63 Subpart ZZZZ
40 CFR 60, NSPS Subpart IIII
40 CFR 60, NSPS Subpart JJJJ (for information only)
40 CFR 60 Subpart XXX (for information only)

cc: Director, OAPP (electronic file submission)
Manager, Data Analysis (electronic file submission)
Chief, Air Enforcement Branch (3AP13), U.S. EPA, Region III (electronic file submission)
Manager, Air Compliance (electronic file submission)



Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Regional Director

**Federal Operating Permit
Article 1**

This permit is based upon the requirements of Title V of the Federal Clean Air Act and Chapter 80, Article 1, of the Commonwealth of Virginia Regulations for the Control and Abatement of Air Pollution. Until such time as this permit is reopened and revised, modified, revoked, terminated or expires, the permittee is authorized to operate in accordance with the terms and conditions contained herein. This permit is issued under the authority of Title 10.1, Chapter 13, § 10.1-1322 of the Air Pollution Control Law of Virginia. This permit is issued consistent with the Administrative Process Act, and 9 VAC 5-80-50 through 9 VAC 5-80-300, of the State Air Pollution Control Board Regulations for the Control and Abatement of Air Pollution of the Commonwealth of Virginia.

Authorization to operate a Stationary Source of Air Pollution as described in this permit is hereby granted to:

Permittee Name: Waste Management Disposal Services of Virginia, Inc.
Facility Name: Middle Peninsula Landfill and Recycling Facility - Gloucester Co.
Facility Location: US Rt. 17, 0.25 miles south of US Rt. 17/St. Rt. 601 Intersection
Registration Number: 40920
Permit Number: PRO-40920

This permit includes the following programs:

Federally Enforceable Requirements - Clean Air Act (Sections I through VII)

State Only Enforceable Requirements (Section VIII) (Optional)

February 4, 2020
Effective Date

February 3, 2025
Expiration Date

Kyle Ivar Winter, P.E.
Deputy Regional Director

February 4, 2020
Signature Date

Table of Contents, 1 page
Permit Conditions, 38 pages



Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Regional Director

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Facility Information

Permittee/Facility Name

Waste Management Disposal Services of Virginia, Inc.
Middle Peninsula Landfill and Recycling Facility
3714 Waste Management Way
Glenns, VA 23149

Responsible Official

Mr. Harold Thacker
Director of Operations
(804) 727-9017

Contact person

Raymond McGowan
Environmental Protection Manager
(804)792-6011

County-Plant Identification Number: 51-073-00032

Facility Description: NAICS Code: 562212- SIC Code 4593/4911 - The Middle Peninsula Landfill and Recycling Facility (MPLRF) consists of a municipal solid waste landfill with gas collection and control system; and a energy recovery system. This source is located in an attainment area for all pollutants. The Middle Peninsula Landfill and Recycling Facility is a non-hazardous municipal solid waste (MSW) landfill located on U.S. Route 17, approximately 1.5 miles north of Adner, Virginia in Gloucester County. MPLRF is owned by the County of Gloucester and operated by Waste Management Disposal Services of Virginia, Inc. (WMDSV). The facility operates under the terms of Solid Waste Permit No. 572, issued by the DEQ Waste Division on August 15, 1994. The DEQ Solid Waste Permit specifies the allowable waste types that can be received and disposed of at MPLRF. In the Solid Waste Permit no restrictions are made prohibiting the disposal of commercial and industrial waste at the MPLRF. According to AP-42 (p 2.4-4), facilities disposing of MSW, commercial, and industrial waste are considered to be co-disposal facilities. The facility is a Title V major source of non-methane organic compounds (NMOC's) as defined under the New Source Performance Standard (NSPS) 'Subpart WWW - Standards of Performance for Municipal Solid Waste Landfills and the Landfill MACT (40 CFR 63 Subpart AAAA). Because the facility is subject to Subpart WWW, it is required to collect and control the emission of landfill gas and is subject to Title V permitting. The MPLRF began accepting waste in June of 1995. An Initial Design Capacity Report received from WMDSV on June 6, 1996 reported the MPLRF to have a design capacity of 35.4 million cubic meters or 46.3 million cubic yards. A Gas Collection and Control System (GCCS) plan was submitted by the source on June 12, 1998. This plan was approved on August 29, 2000. The initial Title V permit was issued on January 1, 2004 and amended on February 15, 2006 and April 24, 2013. The initial [semi-]annual report was submitted on August 23, 2004. Operation of the open flare began on April 8, 1999. Operation of the enclosed flare began on November 6, 2000 (replaced on August 7, 2017 with flare (F03). Operation of the flare (F03) began on November 13, 2017. The facility currently operates under the terms of a State Major Air Permit revised August 7, 2017, which previously added eight Caterpillar landfill gas only spark ignited engine/generators and replaced the LFG enclosed flare with a new utility flare (F03) and retained utility flare (F01). Both utility flares (F01 and F03) have been tested and met the operating and emissions limitations of 40 CFR 60.18 (September 8, 2000 and March 20, 2018. This air permit action is both a significant permit modification based on the August 7, 2017 State Major permit and a Title V renewal. The application was received on October 16, 2017 and was deemed timely and administratively complete. Therefore, the Title V permit application shield is in place.

Emission Units

Process Equipment to be operated consists of:

Emission Unit ID	Stack ID	Emission Unit Description	Size/Rated Capacity*	Pollution Control Device (PCD) Description	PCD ID	Pollutant Controlled	Applicable Permit Date
F01	F01	John Zink	182.16 mmBtu/hr, HHV, 98%	Open Flare Model ZOF, 1999	F01	NMOC	07/17/1998
F03	F03	John Zink or equal	158.84 mmBtu/hr, HHV, 98%	Open Flare	F03	NMOC	08/07/2017
SF1-SF8	SF1-SF8	Solar Flare, portable	50-160 SCFM size; ≤ 420 SCFM Total	(for odor control only)	SF1-SF8	NMOC	07/07/2008
EG1 – EG7	1-7	Caterpillar engine/Generators	10.1 mmBtu/hour each (HHV) (Built 03/08/2007 – 11/20/2007)	AIRC, regulated After cooler circuit and ESP common Breather	EG1 – EG7	NMOC	07/07/2008
EG8	8	Caterpillar engine/Generators	10.1 mmBtu/hour each (HHV) (Built 1988)	AIRC, regulated After cooler circuit and ESP common Breather	EG8	NMOC	07/07/2008
BG1	BG1	Diesel Generator (limited to 1000 hours per year)	288 HP/200 kW (Installed 8/12/1999; Built 1999)	NA	NA	NOx, CO, PM, PM-10, SO ₂ , VOC	06/26/2006
BG2	BG2	Diesel Generator (limited to 500 hours per year)	398 HP/250 kW (Installed 11/2017; Engine Manufacture date 07/2017)**	NA	NA	NOx, CO, PM, PM-10, SO ₂ , VOC	08/08/2017
GEN-1	GEN-1	Generator (Scale House)	5 kW (Built 2003)	NA	NA	NOx, CO, PM, PM-10, SO ₂ , VOC	06/26/2006
GEN-2	GEN-2	Generator (Administrative Office)	5 kW (Built 2003)	NA	NA	NOx, CO, PM, PM-10, SO ₂ , VOC	06/26/2006
LO-1 (includes GCCS-1)	NA	Landfill Operations, includes Gas Collection and Control System	46.3 million cubic yards, 3.22 billion scf LFG	See Flares above	GCCS-1	NMOC	07/17/1998
AST-25	NA	AST – Gasoline Storage Tank	275 Gallons***	NA	NA	VOC	09/01/2013

*The Size/Rated capacity and PCD efficiency is provided for informational purposes only, and is not an applicable requirement.

**Emergency generator engine is subject to the applicable requirements of 40 CFR 60 Subpart III.

***Gasoline storage tank is subject to the applicable requirements of 40 CFR 63 Subpart CCCCCC.

Fuel Burning Equipment Requirements – (Emission unit ID# FO1, FO3, BG1, BG2 and EG1 – EG8)

1. Fuel Burning Equipment Requirements - Limitations - The permittee shall operate an active collection and control system, approved by the Administrator that captures the gas generated within the landfill. The GCCS installed at the Middle Peninsula Landfill shall be designed in accordance with 40 CFR 60.752 (b) (2) (ii) (A). The active collection system shall be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control or treatment system equipment. The system shall collect gas from each area, cell or group of cells in the landfill in which solid waste has been placed for a period of 5 years or more if active or 2 years or more if closed or at final grade. The system shall collect gas at a sufficient extraction rate. Also, the system shall be designed to minimize the off-site migration of subsurface gas. Based on the Waste Management Disposal Services of Virginia Title V application, uncontrolled NMOC emission rates are estimated as more than 50 megagrams per year (Mg/yr). Therefore, it is the responsibility of Waste Management Disposal Services of Virginia to keep for the life of the collection system an up-to-date, readily accessible plot map showing each existing and planned collector in the system and providing a unique identification location label for each collector.
(9 VAC 5-80-110, 40 CFR 60.752 (b)(2)(ii)(A), 40 CFR 753 and 40 CFR 758 (d))
2. Fuel Burning Equipment Requirements - Limitations - Non-Methane Organic Compounds (NMOC) contained in the landfill gas shall be controlled by burning in multiple combustion devices. The combustion devices: an open flare (FO1), an open flare (FO3), and eight (8) Caterpillar engine/generators (EG1 – EG8) shall be provided with adequate access for inspection. The enclosed flare (FO2) to be removed prior to startup of open flare (FO3). A sufficient number of control devices shall be in operation at all times to combust the entire flow of landfill gas from the GCCS system.
(9 VAC 5-80-110 and condition 2 of the NSR Permit dated 08/07/2017)
3. Fuel Burning Equipment Requirements - Limitations - The open flares (FO1 and FO3) shall be designed and operated in accordance with §60.18 except as noted in 40 CFR 60.754(e).
(9 VAC 5-80-110, 40 CFR 60.752 and condition 3 of the NSR Permit dated 08/07/2017)
4. Fuel Burning Equipment Requirements - Limitations - Fugitive dust and Fugitive emission controls shall include the following, or equivalent, as approved by DEQ:
 - a. All cover material being stockpiled shall be kept adequately moist to control dust during storage and handling or covered at all times to minimize emissions as appropriate.
 - b. Dust from haul roads and traffic areas shall be controlled by the application of asphalt, water, or suitable chemicals or equivalent methods as approved by the DEQ.
 - c. Reasonable precautions shall be taken to prevent deposition of dirt on public roads and subsequent dust emissions. These measures shall include paving the entrance road to the facility up to the vicinity of the process areas. Trucks leaving the site shall have clean wheels achieved by use of a wheel washer or equivalent. Dirt, product,

or raw material spilled or tracked onto paved surfaces shall be promptly removed or wetted to prevent particulate matter from becoming airborne.

(9 VAC 5-80-110 and condition 4 of the NSR Permit dated 08/07/2017)

5. Fuel Burning Equipment Requirements - Limitations - The primary purpose of the GCCS is to control the migration of methane gas. The permittee shall operate the collection system such that the surface methane concentration is less than 500 ppm above the background level at the surface of the landfill. A negative pressure shall be maintained at each active wellhead except in case of fire, increased well temperature, use of a geomembrane or synthetic cover, or at a decommissioned well. The permittee shall operate each interior, active wellhead in the collection system such that the gas temperature is less than 55 degrees Celsius and with either nitrogen level less than 20% or an oxygen level less than 5%. (9 VAC 5-80-110, 40 CFR 60.753 (b), (c) and (d))
6. Fuel Burning Equipment Requirements - Limitations – The provisions for oxygen, nitrogen, temperature, pressure and surface methane concentrations shall apply at all times except during periods of startup, shut down, or malfunction, provided that the duration of the startup, shutdown, or malfunction does not exceed 5 days for collection systems and does not exceed 1 hour for treatment or control devices. (9 VAC 5-80-110, 40 CFR 60.755 (e))
7. Fuel Burning Equipment Requirements - Limitations – The permittee shall operate the GCCS system such that all collected gas is routed to one or more control devices or a treatment system. In the event that the collection and control system is inoperable, the GCCS gas moving equipment shall be shut down and all vents to the atmosphere shall be closed within 1 hour. (9 VAC 5-80-110, 40 CFR 60.753 (e))
8. Fuel Burning Equipment Requirements - Limitations – The permittee shall operate the control or treatment systems at all times that gas is being collected by the GCCS system. Control devices include the flares (F01 and F03) and the landfill gas treatment system to the engine/generators (EG1 – EG8). (9 VAC 5-80-110 and 40 CFR 60.753 (f))
9. Fuel Burning Equipment Requirements - Limitations – The permittee shall place each well or design component as specified in the GCCS design plan and shall install wells no later than 60 days after the date on which the initial solid waste has been in place for a period of 5 years or more if active or 2 years or more if closed or at final grade. (9 VAC 5-80-110 and 40 CFR 60.755 (b))
10. Fuel Burning Equipment Requirements - Limitations - The generator (BG1) shall be used only for providing power at the location during interruption of service from the normal power supplier, periodic maintenance testing and operational training. Total use for the generator (BG1) may not exceed 1000 hours per year, calculated monthly as the sum of each consecutive 12-month period. (9 VAC 5-80-110 and condition 7 of the NSR Permit dated 08/07/2017)

11. Fuel Burning Equipment Requirements - Limitations - The throughput of landfill gas (LFG) to the LFG Engines (EG1 – EG8) and the flares (F01, F03 and/or SF1-SF8, if used) shall not exceed 2,780,000,000 (2.78 x 10⁹) cubic feet, dry basis, per year, calculated monthly as the sum of each consecutive 12-month period. Compliance for the consecutive 12-month period shall be demonstrated monthly by adding the total for the most recently completed calendar month to the individual monthly totals for the preceding 11 months.
(9 VAC 5-80-110 and condition 8 of the NSR Permit dated 08/07/2017)

12. Fuel Burning Equipment Requirements - Limitations - The approved fuels for the combustion equipment are as follows:

Caterpillar engine/generators (EG1-EG8)	Treated Landfill Gas
Backup Generators (BG1 and BG2)	Diesel Fuel or No. 2 Fuel Oil (S15)
Flares (F01 and F03)	Untreated Landfill Gas

Any request to add a new fuel or a new fuel-burning device may require a permit. A pilot light on flare devices (F01, F03) is fueled with liquid petroleum gas (LPG) or untreated landfill gas. Treated Landfill Gas is the process of compression, filtration, and moisture removal for energy recovery device using requirements per 40 CFR 60.752(b)(2)(iii)(C) and approved for Middle Peninsula Landfill in US EPA letter dated April 18, 2007.
(9 VAC 5-80-110 and condition 9 of the NSR Permit dated 08/07/2017)

13. Fuel Burning Equipment Requirements - Limitations - Except where this permit is more restrictive than the applicable requirement, the NSPS WWW applicable equipment as described in Condition 1 shall be operated in compliance with 40 CFR 60, Subpart WWW.
(9 VAC 5-80-110 and condition 10 of the NSR Permit dated 08/07/2017)

14. Fuel Burning Equipment Requirements - Limitations - Emissions from the operation of the eight (8) Caterpillar LFG engine/generators (EG1-EG8) shall not exceed the limits specified below:

	<u>each engine</u>	<u>combined</u>	
PM	0.8 lbs/hr	26.6 tons/yr	(9 VAC 5-50-260)
PM10 (Filterable)	0.8 lbs/hr	26.6 tons/yr	(9 VAC 5-50-260)
PM2.5 (Filterable)	0.8 lbs/hr	26.6 tons/yr	(9 VAC 5-50-260)
Sulfur Dioxide	0.2 lbs/hr	5.5 tons/yr	(9 VAC 5-50-260)
Nitrogen Oxides (as NO ₂)	3.7 lbs/hr	128.3 tons/yr	(9 VAC 5-50-260)
Carbon Monoxide	6.8 lbs/hr	239.8 tons/yr	(9 VAC 5-50-260)
VOC	0.1 lbs/hr	1.6 tons/yr	(9 VAC 5-50-260)
NMOC	0.1 lbs/hr	4.1 tons/yr	(9 VAC 5-50-260)

These emissions are derived from the estimated overall emission contribution from operating limits. Exceedance of the operating limits may be considered credible evidence of the exceedance of emission limits. Compliance with these emission limits may be determined as stated in Condition numbers 1, 2, 11, 12, and 13.
(9 VAC 5-80-110 and condition 12 of the NSR Permit dated 08/07/2017)

15. Fuel Burning Equipment Requirements - Limitations - Emissions from the two open flares (F01 or F03) system shall not exceed the limits specified below:

PM	3.7 lbs/hr	16.1 tons/yr	(9 VAC 5-50-260)
PM10 (Filterable)	3.7 lbs/hr	16.1 tons/yr	(9 VAC 5-50-260)
PM2.5 (Filterable)	3.7 lbs/hr	16.1 tons/yr	(9 VAC 5-50-260)
Sulfur Dioxide	2.8 lbs/hr	12.1 tons/yr	(9 VAC 5-50-260)
Nitrogen Oxides (as NO2)	12.9 lbs/hr	56.4 tons/yr	(9 VAC 5-50-260)
Carbon Monoxide	48.0 lbs/hr	210.2 tons/yr	(9 VAC 5-50-260)
VOC	0.6 lbs/hr	2.5 tons/yr	(9 VAC 5-50-260)
NMOC	1.5 lbs/hr	6.4 tons/yr	(9 VAC 5-50-260)

These emissions are derived from the estimated overall emission contribution from operating limits. Exceedance of the operating limits may be considered credible evidence of the exceedance of emission limits. Compliance with these emission limits may be determined as stated in Condition numbers 1, 2, 3, 11, 12, and 13.
(9 VAC 5-80-110 and condition 13 of the NSR Permit dated 08/07/2017)

16. Fuel Burning Equipment Requirements - Limitations - The RICE MACT, 40 CFR 63 Subpart ZZZZ §63.6590(a)(2)(iii) for which construction commenced after June 12, 2006 identifies (EG1 – EG7) and (BG-2) as new engines. The requirements are as follows:

Citation	Requirement
63.6603(a) and Table 2d(5) and 2d (4)	Operating Limitations
63.6605	General Compliance Requirements
63.6625 (c),(e)(f)(h), (i) & (j)	Monitoring and Maintenance Requirements
63.6640	Continuous Compliance Requirements
63.6650 and Footnote 2 of Table 2d	Reporting Requirements
63.6655 (c)	Recordkeeping Requirements
63.6665 and Table 8	General Provisions

The facility shall provide notice should the engines (EG1 – EG7) and (BG-2) is replaced, modified or reconstructed and all information required by 40 CFR 63 Subpart ZZZZ to:

R3_APD_Permits@epa.gov

EG8 is identified as an existing engine, since construction was commenced before June 12, 2006. The requirements are as follows:

Citation	Requirement
63.6603(a) and Table 2b, 2d	Operating Limitations
63.6605	General Compliance Requirements
63.6625(e)(h) & (j)	Monitoring and Maintenance Requirements
63.6640	Continuous Compliance Requirements
63.6655(a)(d)(e)	Recordkeeping Requirements

Citation	Requirement
63.6665 and Table 8 (except, per 63.6645(a)(5), the following do not apply: 63.7(b) and (c), 63.8(e), (f)(4) and (f)(6), and 63.9(b)-(e), (g) and (h).	General Provisions

(9 VAC 5-80-110 and 40 CFR §§63.6590(a)(2)(iii) of 40 CFR 63 Subpart ZZZZ)

17. Fuel Burning Equipment Requirements - Limitations - The permittee shall operate in compliance with all applicable requirements of 40 CFR 63 Subpart ZZZZ as required by §§63.6590(c) requiring the permittee to comply with procedure in 40 CFR 60, Subpart IIII (BG-2) in Condition 16 and 18. No further applicable requirements to 40 CFR 63 Subpart ZZZZ applies to these SI RICE engines (EG1 – EG7) and CI RICE engine BG-2 at this time (See Note in Condition 19 below).

For the replaced CAT 3516 engine listed as EG8 (an Existing LFG RICE at Area Sources), or any other SI RICE engine that is switched out and was manufactured/commenced construction prior to June 12, 2006. The commence compliance date is October 13, 2013 and requirements of 40 CFR 63, MACT Subpart ZZZZ in Table 2d as listed, the permittee shall operate in compliance with the following applicable requirements of 40 CFR 63 Subpart ZZZZ:

1. Change oil and filter every 1,440 hours of operation or annually, whichever comes first.
2. Inspect spark plugs every 1,440 hours of operation or annually, whichever comes first.
3. Inspect all hoses and belts every 1,440 hours of operation or annually, whichever comes first, and replace as necessary.

The Additional Requirements (Table 6), the facility shall:

Operate and maintain the stationary RICE and after-treatment control device (if any) according to the manufacturer's emission-related written instructions or develop and follow your own maintenance plan which must provide to the extent practicable for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions.

Note: Sources have the option to utilize an oil analysis program (per § 63.6625(i)) to extend the specified oil change requirement.

(9 VAC 5-80-110, 40 CFR §§63.6590 (c) and 40 CFR Part 60, Subparts IIII and Subpart JJJJ)

18. Fuel Burning Equipment Requirements - Limitations – The permittee must be in compliance with the emission limitations and operating limits in 40 CFR 60, Subpart IIII for the emergency generator (BG-2). The NSPS IIII for stationary reciprocating internal combustion engine (RICE) used by the emergency generator requirements are as follows:

Citation	Requirement
§ 60.4200(e)	Temporary Engines
§ 60.4205(b) and § 60.4202	Emissions Standards

Citation	Requirement
§60.4207(a, b and c)	Fuel Requirements
§60.4209(a and b)	Monitoring Requirements
§60.4206, §60.4211(a, c, f and g)	Compliance Requirements
§60.4212	Testing Requirements
§60.4214(b)	Notification and Reports
§60.4214(c)	Records Requirements
§60.4214 and Table 8	General Provisions

The stationary reciprocating internal combustion engine (RICE) used by the emergency generator (BG-2) can only combust non-road diesel fuel that meets the requirements of 40 CFR 80.510(b). The stationary RICE emergency generator (BG-2) shall have installed a non-resettable hour meter. Engines equipped with diesel particulate filters must have installed a backpressure monitor.

(9 VAC 5-80-110 and 40 CFR 60, Subpart IIII)

19. Fuel Burning Equipment Requirements - Limitations – The permittee must be in compliance with the emission limitations and operating limits in 40 CFR 60, NSPS Subpart JJJJ, should the facility replace any of the LFG engine generators (EG-1 - EG-8) with NSPS Subpart JJJJ applicable engine(s) during this permit term. The 40 CFR 60, NSPS Subpart JJJJ Summary of requirements are as follows:

Citation	Requirement
§60.4230	Engine Applicability
§60.4233, §60.4234 and Table 1	Emissions Standards
§60.4235 to §60.4237	Other Requirements
§60.4243	Compliance Requirements
§60.4244 and Table 2	Testing Requirements
§60.4245	Notification and Reports
§60.4246 and Table 3	General Provisions
§60.4248	Definitions

The facility upon applicability of 40 CFR 60, NSPS Subpart JJJJ, shall keep a maintenance plan and records of conducted maintenance and shall, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. The facility must also conduct an initial performance test within 1 year of applicable engine startup and conduct subsequent performance testing every 8,760 hours or 3 years, whichever comes first, thereafter to demonstrate compliance.

Note: A physical change, such as a like-for-like replacement event for EG1-EG8 at the stationary source would be subject to permitting under State Regulations 9VAC5-80-50, 9 VAC5-80-1100, 9VAC5-80-1602, if the replacement engine's manufacture date changes regulatory applicability for that engine (i.e. an engine subject to 40 CFR 60 Subpart JJJJ replaces an engine not subject to 40 CFR 60 Subpart JJJJ, or an engine not subject to 40 CFR 60 Subpart JJJJ, replaces an engine subject to 40 CFR 60 Subpart JJJJ). Application for such a change must be made sixty (60) days in advance of the planned work (including 40 CFR 60 Subpart IIII and/or Subpart JJJJ). Otherwise, a like-for-like replacement with no

change in 40 CFR 60 Subpart IIII and/or 40 CFR 60 Subpart JJJJ regulatory status is subject to a fifteen (15) day letter notification before the planned switchout. In the event of an emergency replacement, the facility shall provide notification to DEQ and request the Administrator approve the reduced emergency switchout timeline. For affected engines(s), that are subject to 40 CFR 60 Subpart IIII and/or 40 CFR Subpart JJJJ, the facility shall comply with applicable notification and reporting requirements of the NSPS. (9 VAC 5-80-110 and 40 CFR 60, Subpart IIII and Subpart JJJJ)

20. Fuel Burning Equipment Requirements - Limitations - All existing emergency compression ignition (CI) stationary RICE, (including BG-1, GEN-1 and GEN-2), with a site rating of less than or equal to 500 hp shall be in compliance with 40 CFR 63, Subpart ZZZZ by May 3, 2013. These units shall comply with the following requirements, as applicable:

Citation	Requirement
§63.6603(a) and Table 2d	Operating Limitations
§63.6605	General Compliance Requirements
§63.6625(e)(f)(h) and (j)	Monitoring and Maintenance Requirements
§63.6640	Continuous Compliance Requirements
§63.6650 and Footnote 2 of Table 2d	Reporting Requirements
§63.6655 except (c) and §63.6660	Recordkeeping Requirements
§63.6665 and Table 8	General Provisions

a. Emission limitations in 40 CFR 63.6603 (Table 2d):

- i. Except during periods of startup of the engine, change oil and filter every 500 hours of operation or annually, whichever comes first;
- ii. Except during periods of startup of the engine, inspect air cleaner every 1,000 hours of operation or annually, whichever comes first, and replace as necessary;
- iii. Except during periods of startup of the engine, inspect all hoses and belts every 500 hours of operation or annually, whichever comes first, and replace as necessary.
- iv. During periods of startup of the engine, minimize the engine's time spent at idle and minimize the engine's startup time at startup to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes, after which time the non-startup emission limitations apply.

b. General compliance requirements in 40 CFR 63.6605:

- i. The permittee must be in compliance with the emission limitations and operating limits in this subpart that apply at all times.
- ii. At all times the permittee must operate and maintain any affected source including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions. The general duty to minimize emissions does not require you to make any further efforts to reduce emissions if levels required by this

standard have been achieved. Determination of whether such operation and maintenance procedures are being used will be based on information available to the Administrator which may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source.

- c. Monitoring, installation, collection, operation, and maintenance requirements in 40 CFR 63.6625(e), (f), (h*), and (i):
 - i. Operate and maintain the stationary RICE and after-treatment control device (if any) according to the manufacturer's emission-related written instructions or develop your own maintenance plan which must provide to the extent practicable for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions.
 - ii. Install a non-resettable hour meter, if one is not already installed.
 - iii. The permittee shall have the option to utilize the oil analysis program as described in 40 CFR 63.6625(i) in order to extend the specified oil change requirement in paragraph a. (above).
- d. Continuous compliance requirements in 40 CFR 63.6640 and reporting requirements in 40 CFR 63.6650:
 - i. Report each instance in which you did not meet each emission limitation or operating limitation in Table 2d that applies to you and report these deviations according to the requirements in 40 CFR 63.6650.
 - ii. Report each instance in which you did not meet the requirements in Table 8 that apply to you.
 - iii. Any operation other than emergency operation, maintenance, and testing, and operation in non-emergency situations for more than 50 hours per year, as permitted in these conditions, is prohibited.
 - iv. There is no time limit on the use of emergency stationary RICE in emergency situations.
 - v. The permittee may operate the emergency stationary RICE for the purpose of maintenance checks and readiness testing, provided that the tests are recommended by Federal, State or local government, the manufacturer, the vendor, or the insurance company associated with the engine. Maintenance checks and readiness testing of such units is limited to 100 hours per year. The owner or operator may petition the Administrator for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the owner or operator maintains records indicating that Federal, State, or local standards require maintenance and testing of emergency RICE beyond 100 hours per year.

- vi. The permittee may operate the emergency stationary RICE up to 50 hours per year in non-emergency situations, but those 50 hours are counted towards the 100 hours per year provided for maintenance and testing.
 - 1. The 50 hours per year for non-emergency situations cannot be used for peak shaving or to generate income for a facility to supply power to an electric grid or otherwise supply power as part of a financial arrangement with another entity.
 - 2. In order for the emergency stationary engine to be considered an emergency stationary reciprocating internal combustion engine (RICE) under 40 CFR 63, Subpart ZZZZ, the operation of the emergency stationary RICE are limited to emergency situations as specified in 40 CFR §63.6640(f)(1); maintenance checks and readiness testing for a limited number of hours per year as specified in 40 CFR §63.6640(f)(2)(i); and certain non-emergency situations for a limited number of hours per year as specified in 40 CFR §63.6640(f)(3). If the unit is not operated in accordance with 40 CFR §63.6640(f)(1), §63.6640(f)(2)(i) or §63.6640(f)(3), the emergency stationary engine will not be considered an emergency stationary RICE under 40 CFR Part 63, Subpart ZZZZ and must meet the emissions standards and other applicable requirements for a non-emergency engines.
- vii. The permittee shall submit a summary report of monitoring and recordkeeping activities postmarked on or before January 30 and June 30 of each calendar year for the preceding six-month period and noncompliance must be clearly identified.
- viii. The summary report shall also include any reporting required under 40CFR 63.6640(f), as necessary.
- e. Recordkeeping requirements in 40 CFR 63.6655 (except (c)) and 63.6660:
 - i. A copy of each notification and report that the permittee submitted to comply with this subpart, including all documentation supporting any Initial Notification or Notification of Compliance Status that you submitted, according to the requirement in 40 CFR 63.10(b)(2)(xiv).
 - ii. Records of the occurrence and duration of each malfunction of operation (i.e., process equipment) or the air pollution control and monitoring equipment.
 - iii. Records of all required maintenance performed on the air pollution control and monitoring equipment.
 - iv. Records of action taken during periods of malfunction to minimize emissions in accordance with paragraph c. (above), including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation.

- v. Records of the maintenance conducted on the RICE pursuant to paragraph c. (above).
 - vi. Records of the hours of operation of the engine that is recorded through the non-resettable hour meter. The permittee shall document how many hours are spent for emergency operation; including what classified the operation as emergency and how many hours are spent for non-emergency operation. If the engines are used for demand response operation, the permittee shall keep records of the notification of the emergency situation, and the time the engine was operated as part of demand response.
 - vii. The permittee shall keep each record in a form suitable and readily accessible in hard copy or electronic form for at least 5 years after the date of each occurrence, measurement, maintenance, corrective action, report, or record, according to 40 CFR 63.10(b)(1).
- f. Requirements as specified in Footnote 1 of Table 2d: If an emergency engine is operating during an emergency and it is not possible to shut down the engine in order to perform the management practice requirements on the schedule required in condition paragraph a. (above), or if performing the management practice on the required schedule would otherwise pose an unacceptable risk under Federal, State, or local law, the management practice can be delayed until the emergency is over or the unacceptable risk under Federal, State, or local law has abated. Sources must report any failure to perform the management practice on the schedule required and the Federal, State, or local law under which the risk was deemed unacceptable.
- g. Requirements of the General Provisions listed in 40 CFR Subpart A, as applicable pursuant to Table 8 of 40 CFR 63 Subpart ZZZZ, except per 63.6645(a)(5), the following do not apply: 63.7(b) and (c), 63.8(e), (f)(4) and (f)(6), and 63.9(b)-(e), (g) and (h).

(9 VAC 5-80-110, 40 CFR 63.6603, 63.6605, 63.6625, 63.6640, 63.6645, 63.6650, 63.6655, 63.6660 and referenced Subpart ZZZZ tables)

21. Fuel Burning Equipment Requirements - Limitations - Visible emissions from the landfill gas fuel burning equipment shall not exceed 10 percent opacity except during one six-minute period in any one hour in which visible emissions shall not exceed 20 percent opacity as determined by the EPA Method 9 (reference 40 CFR 60, Appendix A). At all times, including periods of startup, shutdown and malfunction, owners shall, to the extent practicable, maintain and operate any affected source, including associated air pollution control equipment, in a manner consistent with good air pollution control practices for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Virginia Department of Environmental Quality, which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspections of the source.

(9 VAC 5-80-110 and condition 14 of the NSR Permit dated 08/07/2017)

22. Landfill Operations and GCCS Requirements - Monitoring - The GCCS shall be equipped with a continuous gas flow rate measuring device that shall record flow to, or bypass from, the landfill gas flares. The open flares (F01 and F03) shall be equipped with a heat sensing device to indicate the continuous presence of a flame. Each monitoring device shall be installed, maintained, calibrated and operated in accordance with approved procedures which shall include, as a minimum, the manufacturer's written requirements or recommendations. Each monitoring device shall be provided with adequate access for inspection and shall be active whenever the associated combustion equipment is processing landfill gas.
(9 VAC 5-80-110 and 40 CFR 60.756 and condition 5 of the NSR Permit dated 08/07/2017)
23. Fuel Burning Equipment Requirements – Monitoring - The open flares (F01 and F03) monitoring devices used to continuously measure total gas flow and flame presence shall be recorded by the permittee with a frequency of not less than once every 15 minutes. The permittee shall keep a log of the continuously recorded measurements of the gas flow rate and flame presence.
(9 VAC 5-80-110, 40 CFR 60.756 and condition 6 of the NSR Permit dated 08/07/2017)
24. Fuel Burning Equipment Requirements – Monitoring - The permittee shall perform a daily visual evaluation, Monday through Friday, when operating, except when closed for holidays, on the engines. If such visual observation indicates any visible emissions, the permittee shall take corrective actions to eliminate the visible emissions. If such corrective action fails to eliminate visible emissions, the permittee shall conduct a visible emissions evaluation (VEE) using 40 CFR 60, Appendix A, Method 9 for six minutes. If the six minute VEE opacity average exceeds 10%, the VEE shall continue for an additional twelve minutes. If any of the six-minute averages during the 18 minutes exceeds 20% opacity, the VEE shall continue for one hour from initiation, to determine compliance with the opacity limit. The permittee shall record the details of the visual emissions observations, VEE, and any corrective actions.
(9 VAC 5-80-110 E)
25. Fuel Burning Equipment Requirements – Monitoring - The permittee shall perform periodic visual evaluations of the flare(s) once each day, Monday through Friday, when operating, except when closed for holidays, for compliance with the opacity standards for fuel burning equipment. If such periodic evaluations indicate any visible emissions, the permittee shall take appropriate action, immediately, to return the unit to normal operation such that no visible emissions exist. If such corrective action fails to eliminate visible emissions, the permittee shall conduct a visible emissions evaluation (VEE) utilizing EPA Method 22 (reference 40 CFR, Appendix A). If a method 22 evaluation and/or corrective action becomes necessary, the permittee shall record the details of the incident in a logbook. The logbook shall be kept on site and available for inspection by the DEQ for the most recent five year period.
(9 VAC 5-80-110 E)
26. Landfill Operations and GCCS Requirements - monitoring - As an affected source, the Middle Peninsula Landfill is categorized as an 'existing landfill' in 40 CFR Part 63, Subpart AAAA. The additional requirements beyond those in the NSPS WWW include development of the 'SSM' plan and the start of semi-annual reporting for the GCCS system (GCCS-1), beginning January 16, 2004 (and as amended by FR 20446 dated April 20, 2006).

(9 VAC 5-80-110, 40 CFR 63.6(e)(3), 40 CFR 63.1930 through 63.1990 and condition 15 of the NSR Permit dated 08/07/2017)

27. Landfill Operations and GCCS Requirements - Monitoring - The permittee shall measure gauge pressure in the header at each individual active well monthly. If a positive pressure exists, action shall be initiated to correct the exceedance within 5 calendar days. If a negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement, the system shall be expanded within 120 days of the initial measurement of positive pressure. Exceptions to this requirement are listed under 40 CFR 60.753 (b)(1)-(b)(3). If corrective actions are taken as specified in 60.755, the monitored exceedance is not a violation of the operational requirements. An alternative timeline for correcting the exceedance may be submitted to the Administrator for approval.
(9 VAC 5-80-110, 40 CFR 60.753 (g) and 40 CFR 60.755 (a)(3))
28. Landfill Operations and GCCS Requirements - Monitoring - The permittee shall monitor each active well monthly for temperature and nitrogen or oxygen. If a well exceeds one of these operating parameters (see 40 CFR 60.753(c) for parameters and higher operating values), action shall be initiated to correct the exceedance within 5 calendar days. If correction of the exceedance cannot be achieved within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial exceedance. If corrective actions are taken as specified in 40 CFR 60.755, the monitored exceedance is not a violation of the operational requirements. An alternative timeline for correcting the exceedance may be submitted to the Administrator for approval.
(9 VAC 5-80-110, 40 CFR 753 (g) and 40 CFR 60.755 (a)(5))
29. Landfill Operations and GCCS Requirements - Monitoring - Surface methane monitoring shall be conducted along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals as detailed in the updated Surface Monitoring Design Plan and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover. Under the Consent Order signed with EPA Region III on December 4, 2004, the facility is required to show compliance with this updated plan in future records and reports of surface monitoring.
(9 VAC 5-80-110 and 40 CFR 60.753 (d))
30. Landfill Operations and GCCS Requirements - Monitoring - The permittee shall monitor surface concentration of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals for each collection area for which waste has been in place for two or more years if closed or at final grade or for which waste has been in place for five or more years if active. This surface methane monitoring shall take place on a quarterly basis and using an organic vapor analyzer, flame ionization detector or other portable monitor meeting the specifications provided in paragraph (d) of 40 CFR 60.755. Areas with steep slopes, the active working face or other dangerous areas have been excluded from this monitoring as approved by the Director, Piedmont Regional Office.
(9 VAC 5-80-110 and 40 CFR 60.755 (c)(1))

31. Landfill Operations and GCCS Requirements - Monitoring – The background concentration of methane during surface emissions monitoring shall be determined for the instrument measuring the surface concentrations of methane by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells. Surface emission monitoring shall be performed in accordance with 40 CFR 60, Appendix A, Method 21, Section 8.3.1, except that the probe inlet shall be placed within 5 to 10 centimeters of the ground. Monitoring shall be performed during typical meteorological conditions.
(9 VAC 5-80-110 and 40 CFR 60.755(c)(2) through 60.755(c)(3))
32. Landfill Operations and GCCS Requirements - Monitoring – The portable analyzer used to determine the surface methane concentration shall meet the instrument specifications provided in 40 CFR 60, Appendix A, Method 21, except that methane shall replace all references to VOC. The calibration gas shall be methane, diluted to a nominal concentration of 500 ppm in air. To meet the performance evaluation requirements in Method 21, the instrument evaluation procedures in Method 21, of Appendix A shall be used. The calibration procedures in Method 21 shall be followed immediately before commencing a surface monitoring survey.
(9 VAC 5-80-110 and 40 CFR 60.755 (d))
33. Landfill Operations and GCCS Requirements - Monitoring - Any reading of surface methane of 500 ppm or more above background at any location shall be recorded as a monitored exceedance and the actions specified below shall be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements.
 - a. The location of the exceedance shall be marked and recorded.
 - b. The permittee shall perform cover maintenance or make adjustments to the vacuum of the adjacent wells to increase the gas collection in the vicinity of the exceedance. The location shall be re-monitored within 10 calendar days of detecting the exceedance.
 - c. If the re-monitoring of the location shows a second exceedance, the permittee shall take additional corrective action and shall monitor the location again within 10 days of the second exceedance. If the re-monitoring shows a third exceedance for the location, the action specified in (e) below shall be taken, and no further monitoring of that location is required until the action specified in (e) has been taken.
 - d. Any location that initially showed an exceedance but has methane concentration less than 500 ppm above background at the 10-day re-monitoring (specified in (b) or (c)) shall be re-monitored 1 month from the initial exceedance. If the 1-month re-monitoring shows a concentration less than 500 ppm above background, no further monitoring of that location is required until the next quarterly monitoring. If the 1-month re-monitoring shows an exceedance, the permittee shall repeat the requirements of either paragraph (c) or (e) of this condition.
 - e. For any location where the monitored methane concentration equals or exceeds 500 ppm above background 3 times within a quarterly period, a new well or other

collection device shall be installed within 120 calendar days of the initial exceedance. An alternative remedy to the exceedance, such as upgrading the blower, header pipes, or control devices, and a corresponding timeline for installation may be submitted to the Director, Piedmont Regional Office.

(9 VAC 5-80-110 and 40 CFR 60.755 (c)(4)(i) through 60.755 (c)(4)(v))

34. Landfill Operations and GCCS Requirements - Monitoring - The permittee shall implement a program to monitor for cover integrity and accomplish cover repairs as necessary on a monthly basis.
(9 VAC 5-80-110 and 40 CFR 60.755 (c)(5))
35. Landfill Operations and GCCS Requirements - Monitoring - The permittee shall install a sampling port and a port for temperature measurements at each wellhead. The permittee shall measure the gauge pressure in the gas collection header on a monthly schedule. The permittee shall monitor temperature and nitrogen or oxygen concentrations in the landfill gas, at each wellhead, on a monthly schedule.
(9 VAC 5-80-110 and 40 CFR 60.756 (a))
36. Landfill Operations and GCCS Requirements - Recordkeeping - The permittee shall record and maintain a log of well inspections that indicate a positive pressure had existed and the corrective action taken to correct a measured exceedance at the wellhead. Exceptions to this requirement include; a fire or increased well temperature, use of a geo-membrane or synthetic cover, or a decommissioned well.
(9 VAC 5-80-110 and 40 CFR 60.753 (b)(1) – 753 (b)(3))
37. Landfill Operations and GCCS Requirements - Recordkeeping - The permittee shall develop and maintain a surface monitoring design plan that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the 30 meter intervals.
VAC 5-80-110 and 40 CFR 60.753 (d))
38. Landfill Operations and GCCS Requirements - Recordkeeping - The permittee shall keep for at least 5 years, current, readily accessible, on site records of the design capacity report, based on the original report, dated June 7, 1996, the current amount of waste in place, and the annual placement rates for solid waste. Offsite records may be maintained if they are retrievable within 4 hours. Either paper copy or electronic formats, approved by DEQ, are acceptable.
VAC 5-80-110 and 40 CFR 60.758 (a))
39. Landfill Operations and GCCS Requirements and Fuel Burning Equipment Requirements - Recordkeeping - The permittee shall maintain records of emission data and operating parameters as necessary to demonstrate compliance with this permit. The content and format of such records shall be arranged with the Piedmont Regional Office. These records shall include, but are not limited to:
 - a. Annual total throughput of landfill gas to the LFG Engines (EG1 – EG8) and the flares (F01 and F03 and/or SF1-SF8, if used), calculated monthly as the sum of each consecutive 12-month period. Compliance for the consecutive 12-month period shall

be demonstrated monthly by adding the total for the most recently completed calendar month to the individual monthly totals for the preceding 11 months.

- b. All GCCS and flare system (FO1 and FO2) monitoring information as required by Subpart WWW (40 CFR 60.756) as well as all appropriate data as required by 40 CFR 60.758.
- c. Operating hours for the 200 kW backup generator (BG1) and 250kW emergency generator (BG2).

All records required by this condition and Subpart WWW (40 CFR 60.758) shall be available for inspection by the DEQ and shall be current for the most recent five years.

(9 VAC 5-80-110, 40 CFR 60.758 and condition 16 of the NSR Permit dated 08/07/2017)

- 40. Fuel Burning Equipment Requirements - Recordkeeping - The permittee shall maintain for 5 years, readily accessible complete records of the following monitoring observations:
 - a. Well head gauge pressures measured monthly.
 - b. Wellhead temperatures measured monthly.
 - c. Wellhead nitrogen or oxygen concentrations measured monthly.
 - d. Flow rate of the landfill gas to the control devices or treatment system.
 - e. Maintain information on exceedances related to the quarterly surface methane monitoring.
 - f. Malfunction reports for control or collection devices.

(9 VAC 5-80-110, 40 CFR 60.753 (c) and (d) and 40 CFR 60.758 (c))

- 41. Landfill Operations and GCCS Requirements - Recordkeeping - The permittee shall keep for the life of the collection system an up to date, readily accessible plot map showing each existing and planned collector in the system. This map shall also provide a unique identification location label for each collector. Additionally, the permittee shall maintain readily accessible records of the installation date and location of all newly installed collectors.

(9VAC 5-80-110 and 40 CFR 60.758 (d))

- 42. Landfill Operations and GCCS Requirements - Recordkeeping - The permittee shall maintain for 5 years, readily accessible records of all collection and control system exceedances of the operational standards, including the readings taken in later months showing a return to compliance, and the location where the exceedance occurred.

(9 VAC 5-80-110 and 40 CFR 60.758 (e))

43. Landfill Operations and GCCS Requirements and Fuel Burning Equipment Requirements - Recordkeeping - The permittee shall maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of the landfill gas collection and control system, any malfunction of the air pollution control equipment or any periods during which a continuous monitoring system or monitoring device is inoperative for more than one hour.
(9 VAC 5-80-110 and 40 CFR 60.758 (c)(1))
44. Fuel Burning Equipment Requirements - Recordkeeping - The permittee shall maintain records for flares (F01 and F02) and LFG engines (EG1-EG8) of the required training including a statement of time, place and nature training provided. The permittee shall have available good written operating procedures and a maintenance schedule for the combustion equipment. These procedures shall be based on the manufacturer's recommendations, at minimum. All records required by this condition shall be kept on site for a five year period and made available for inspection by the DEQ.
(9 VAC 5-80-110)
45. Fuel Burning Equipment Requirements - Testing - Initial and subsequent performance tests shall be conducted for NOx and CO from each of the LFG Caterpillar 3516 engine/generators (EG1-EG8) to determine compliance with the emission limits contained in Condition 14 (when installed). The tests shall be performed while operating on treated landfill gas only. The tests shall be performed at not less than 80% of the rated capacity of the electrical output on one engine. The tests shall be performed and demonstrate compliance within 60 days after achieving the maximum expected operating rate for the facility, but in no event later than 180 days after start-up of the complete engine installation. The subsequent performance tests required shall at a minimum be conducted once every five years on all eight LFG engines and before the operating permit renewal application for NOx and CO. The tests shall be conducted and reported and data reduced as set forth in 9 VAC 5-50-30 and the test methods and procedures contained in each applicable section or subpart listed in 9 VAC 5-50-410. The details of the tests are to be arranged with the Piedmont Regional Office. The permittee shall submit a test protocol at least 30 days prior to testing. Two copies of the test results shall be submitted to the Director, Piedmont Regional Office within 60 days after test completion and shall conform to the test report format enclosed with this permit.
(9 VAC 5-80-110 and condition 17 of the NSR Permit dated 08/07/2017)
46. Fuel Burning Equipment Requirements - Testing - Concurrently with the initial and subsequent performance tests required in Condition 45, Visible Emission Evaluations (VEE) in accordance with 40 CFR Part 60, Appendix A, Method 9, shall also be conducted by the facility on those LFG engines (EG1-EG8) tested. Each test shall consist of 30 sets of 24 consecutive observations (at 15 second intervals) to yield a six minute average. The details of the tests are to be arranged with the Director, Piedmont Region. The facility shall submit a test protocol at least 30 days prior to testing. The evaluation shall be performed, and reported and demonstrate compliance within 60 days after achieving the maximum production rate at which the facility will be operated but in no event later than 180 days after start-up of the engine installation. Should conditions prevent concurrent opacity observations, the Director, Piedmont Region shall be notified in writing, within seven days, and visible emissions testing shall be rescheduled within 30 days. Rescheduled testing shall be conducted under the same conditions (as possible) as the initial performance tests.

Two copies of the test result shall be submitted to the Director, Piedmont Region within 60 days after test completion and shall conform to the test report format enclosed with this permit.

(9 VAC 5-80-110, 9 VAC 5-50-410 and condition 18 of the NSR Permit dated 08/07/2017)

47. Landfill Operations and GCCS Requirements - Testing - If measured, the nitrogen level at each wellhead shall be determined by using Method 3C.
(9 VAC 5-80-110 and 40 CFR 60.753 (c)(1))
48. Landfill Operations and GCCS Requirements - Testing - The Oxygen level at each wellhead shall be determined by an oxygen meter using Method 3A or 3C, except for the following:
 - a. The span shall be set so that the regulatory limit is between 20 and 50 percent of the span.
 - b. A data recorder is not required.
 - c. Only a zero and a span calibration gas are required. Ambient air may be used as span.
 - d. A calibration error check is not required.
 - e. The allowable sample bias, zero drift, and calibration drift are +/- 10%.

(9 VAC 5-80-110 and 40 CFR 60.753 (c)(2))
49. Fuel Burning Equipment Requirements – Testing – Concurrently with the visible emissions performance tests on the open flare designated F01, the actual exit velocity of the open flare shall be determined by Reference Methods 2, 2A, 2C or 2D as appropriate, by the unobstructed (free) cross sectional area of flare tip.
(9 VAC 5-50-410, 9 VAC 5-80-110 and 40 CFR 60.18 (f)(4))
50. Fuel Burning Equipment Requirements – Testing - If testing is conducted in addition to the monitoring specified in this permit, the permittee shall use the appropriate method(s) in accordance with procedures approved by the DEQ.
(9 VAC 5-80-110)
51. Fuel Burning Equipment Requirements - Reporting – The satisfactory operation of the monitoring equipment shall comply with Subpart WWW (40 CFR 60.752 and 40 CFR 60.756), including certification that manufacturer's written requirements or recommendations for installation, operation and calibration of the device have been followed.
(9 VAC 5-80-110 and condition 19 of the NSR Permit dated 08/07/2017)
52. Landfill Operations and GCCS Requirements & Fuel Burning Equipment Requirements - Reporting – The permittee shall demonstrate compliance with operational standards for the GCCS required by Subpart WWW (40 CFR 60.753) in accordance with appropriate subsection(s) of Subpart WWW (40 CFR 60.755). The permittee shall demonstrate compliance of the GCCS requirements of Subpart WWW (40 CFR 60.752) in accordance

with appropriate subsection(s) of Subpart WWW (40 CFR 60.755). All reports required to demonstrate compliance with the compliance requirements of Subpart WWW (40 CFR 60.755) shall be prepared and submitted to the Piedmont Regional Office as required by Subpart WWW (40 CFR 60.757(f)(1) – (f)(6).
(9 VAC 5-80-110, 40 CFR 60.753 – 60.757 and condition 20 of the NSR Permit dated 08/07/2017)

53. Landfill Operations and GCCS Requirements & Fuel Burning Equipment Requirements - Reporting – On March 1st and September 1st of each year, routine reports required by the Landfill MACT and the NSPS for the operation of the GCCS shall be submitted to the DEQ. Other non-routine reports, based on construction or operating situations are described below.

Report Name	Periods Covered	Report Due Dates	Ref. Condition Nos.	Regulation Citations
NSPS Compliance	Jan, 1 st to Jun. 30 th Jul. 1 st to Dec. 31 st	March 1 st & Sept. 1 st	10, 11 and 13.	40 CFR 60.753 to 60.757
Landfill MACT, SSM Report	Jan, 1 st to Jun. 30 th Jul. 1 st to Dec. 31 st	March 1 st & Sept. 1 st	22.	40 CFR 63.1980
Gas Well as-built On-site Update Report	Within 60 days of construction	As required by construction activity	1.	40 CFR 60.752 (b)(2)(ii)(A) and 40 CFR 758
Semi-annual Monitoring	Jan, 1 st to Jun. 30 th Jul. 1 st to Dec. 31 st	March 1 st & Sept. 1 st	22.	9 VAC 5-80-110

(9 VAC 5-80-110, 40 CFR 60.752, 40 CFR 60.753 to 40 CFR 60.757 and 40 CFR 63.1980)

54. Landfill Operations and GCCS Requirements & Fuel Burning Equipment Requirements - Reporting – The permittee shall maintain for 5 years, readily accessible complete records of the following:
- Instances when positive pressure at a wellhead occurred due to efforts to avoid a fire. If no such instances occur, the permittee shall submit a negative report.
 - Values measured, time recorded for each exceedances of pressure, temperature, nitrogen or oxygen measurements at wellheads. Exceptions exist for pressure where a geomembrane or synthetic cover is used and for decommissioned wells.
 - Description and duration of all periods when the control device was not operating for a period exceeding 1 hour and length of time the control device was not operating.
 - All instances when the GCCS was not operating for more than five consecutive days.
 - All instances where surface methane concentration exceeded 500 ppm; the actual concentration recorded and the location on the plot plan of that exceedance.

- f. Records of GCCS expansion, including dates, locations and equipment installed in the process of expanding the GCCS.
- g. Startup, shutdown and malfunction (SSM) plan activity reports.

(9 VAC 5-50-410, 9 VAC 5-80-110, 40 CFR 60.757, 40 CFR 60.753 and 40 CFR 63.1980)

55. Fuel Burning Equipment Requirements - Reporting – The permittee shall furnish written notification to the Director, Piedmont Regional Office of the anticipated dates of performance tests, postmarked at least 30 days prior to the date of the tests.

Copies of these written notifications shall be sent to:

R3_APD_Permits@epa.gov

(9 VAC 5-50-410, 9 VAC 5-80-110 and 40 CFR 60.7 (a))

56. Landfill Operations and GCCS Requirements - Reporting – The permittee shall submit the closure report to DEQ and the Administrator within 30 days of waste acceptance cessation.

(1) The equipment removal report shall contain all of the following items:

- (i) A copy of the closure report submitted in accordance with 40 CFR 60.757(d);
- (ii) A copy of the initial performance test report demonstrating that the 15 year minimum control period has expired; and
- (iii) Dated copies of three successive NMOC emission rate reports demonstrating that the landfill is no longer producing 50 megagrams or greater of NMOC per year.

(2) The Administrator may request such additional information as may be necessary to verify that all of the conditions for removal in 40 CFR 60.752(b)(2)(v) below have been met.

The collection and control system may be capped or removed provided that all the conditions of paragraphs 40 CFR 60.752(b)(2)(v) (A), (B), and (C) are met:

(A) The landfill shall be a closed landfill as defined in 40 CFR 60.751. A closure report shall be submitted to the Administrator as provided in 40 CFR 60.757(d);

(B) The collection and control system shall have been in operation a minimum of 15 years; and

(C) Following the procedures specified in 40 CFR 60.754(b), the calculated NMOC gas produced by the landfill shall be less than 50 megagrams per year on three successive test dates. The test dates shall be no less than 90 days apart, and no more than 180 days apart.

DEQ may request additional information as may be necessary to verify that permanent closure has taken place in accordance with the requirements of 9 VAC 20-80-250 E & F and

40 CFR 258.60. If a closure report has been submitted to the DEQ, no additional wastes may be placed into the landfill without filing a notification of modification.
(9 VAC 5-80-110, 9 VAC 5-50-410, 60.752(b)(2)(v), 40 CFR 60.757(d - e))

Facility Wide Conditions

57. Facility Wide Conditions - Limitations – Total emissions from the operation of the fuel-burning equipment (LFG Engines (EG1-EG8), two Open Flares (F01, F03), 200kW generator (BG1), 250kW generator (BG2) and solar flares (SF1-SF8)) shall not exceed the limits specified below:

PM (Filterable)	32.5 tons/yr	(9 VAC 5-50-260)
PM10 (Filterable)	32.5 tons/yr	(9 VAC 5-50-260)
PM2.5 (Filterable)	32.5 tons/yr	(9 VAC 5-50-260)
Sulfur Dioxide	13.6 tons/yr	(9 VAC 5-50-260)
Nitrogen Oxides (as NO ₂)	168.1 tons/yr	(9 VAC 5-50-260)
Carbon Monoxide	348.0 tons/yr	(9 VAC 5-50-260)
VOC	3.7 tons/yr	9 VAC 5-50-260)
NMOC	8.5 tons/yr	(9 VAC 5-50-260)

These emissions are derived from the estimated overall emission contribution from operating limits. Exceedance of the operating limits may be considered credible evidence of the exceedance of emission limits. Compliance with these emission limits may be determined as stated in Condition numbers 1, 2, 3, 11, 12, and 13.
(9 VAC 5-80-1180 and condition 11 of the NSR Permit dated 08/07/2017)

58. Facility Wide Conditions - Limitations – The opacity standard (visible emission standard) shall apply at all times except during periods of startup, shutdown, and malfunction and as otherwise provided in the applicable standard.
(9 VAC 5-50-20 A and 9 VAC 5-80-110)
59. Facility Wide Conditions - Limitations - At all times, including periods of startup, shutdown and malfunction, owners shall, to the extent practicable, maintain and operate any affected source, including associated air pollution control equipment, in a manner consistent with good air pollution control practices for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Virginia Department of Environmental Quality, which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspections of the source.
(9 VAC 5-50-20 E, 9 VAC 5-50-380, 9 VAC 5-20-180 A, and 9 VAC 5-80-110)
60. Facility Wide Conditions - Limitations - In case of shutdown or bypassing, or both, of air pollution control equipment for necessary scheduled maintenance which results in excess emissions for more than one hour, the intent to shut down such equipment shall be reported to the board and local air pollution control agency, if any, at least 24 hours prior to the planned shutdown. Such prior notice shall include, but is not limited to, the following:

- a. Identification of the specific facility to be taken out of service as well as its location and permit or registration number;
- b. The expected length of time that the air pollution control equipment will be out of service;
- c. The nature and quantity of emissions of air pollutants likely to occur during the shutdown period, and,
- d. Measures that will be taken to minimize the length of the shutdown or to negate the effect of the outage of the air pollution control equipment.

(9 VAC 5-50-380, 9 VAC 5-20-180 C and 9 VAC 5-80-110)

61. Facility Wide Conditions - Testing - In the event that any affected facility or related air pollution control equipment fails or malfunctions in such a manner that may cause excess emissions for more than one hour, the owner shall, as soon as is practicable but no later than four daytime business hours, notify the board by facsimile transmission, telephone or electronic mail of such failure or malfunction and shall within two weeks provide a written statement giving all pertinent facts, including the estimated duration of the breakdown. The use of email is an approved method of meeting the 14 day written notification. When the condition causing the failure or malfunction has been corrected and the equipment is again in operation, the owner shall notify the board.

(9 VAC 5-50-380, 9 VAC 5-20-180 C and 9 VAC 5-80-110)

62. Facility Wide Conditions - Testing - If testing is conducted in addition to the monitoring specified in this permit, the permittee shall use the appropriate method(s) in accordance with procedures approved by the DEQ.

(9VAC5-80-110)

63. Facility Wide Gasoline Dispensing requirements – MACT Limitations – Except where this permit is more restrictive than the applicable requirement, the MACT equipment as described in Condition1 shall be operated in compliance with the requirements of 40 CFR 63, Subpart CCCCCC (when storing gasoline). The facility shall, at all times, operate and maintain any affected source, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions. Determination of whether such operation and maintenance procedures are being used will be based on information available to the Administrator which may include, but is not limited to, monitoring results, review of operation and maintenance procedures, review of operation and maintenance records, and inspection of the source. The facility shall keep applicable records as specified in §63.11125(d) and §63.11126(b). Based on the monthly throughput of gasoline at the landfill facility (less than 10,000 gallons/month), the following recordkeeping and work practice standards listed in 40 CFR 63.11116 apply to the facility. The facility shall comply with the following:

Citation	Requirement
§63.11111	Am I subject to the requirements in this subpart?

§63.11113	When do I have to comply with this subpart?
§63.11115	What are my general duties to minimize emissions?
§63.11116	Requirements for facilities (monthly <10,000 gallons gasoline).
§63.11125	What are my recordkeeping requirements?
§63.11126	What are my reporting requirements?

- a. The facility must not allow gasoline to be handled in a manner that would result in vapor releases to the atmosphere for extended periods of time. Measures include, but are not limited to, the following:
 - (1) Minimize gasoline spills;
 - (2) Clean up spills as expeditiously as practicable;
 - (3) Cover all open gasoline containers and all gasoline storage tank fill-pipes with a gasketed seal when not in use;
 - (4) Minimize gasoline sent to open waste collection systems that collect and transport gasoline to reclamation and recycling devices, such as oil/water separators.
- b. The facility is not required to submit notifications or reports as specified in §63.11125, §63.11126, or subpart A of this part, but you must have records available within 24 hours of a request by the Administrator to document your gasoline throughput.
- c. The facility must comply with the requirements of this subpart by the applicable dates specified in §63.11113 (January 24, 2014).
- d. Portable gasoline containers that meet the requirements of 40 CFR part 59, subpart F, are considered acceptable for compliance with paragraph (a)(3) of this section.

The gasoline throughput records and applicable records as specified in §63.11125(d) and §63.11126(b) shall be available for inspection by the DEQ and shall be current for the most recent five years.

(9 VAC 5-80-110, §63.11113, §63.11116 and §63.11126)

64. Insignificant Emission Units - The following emission units at the facility are identified in the application as insignificant emission units under 9VAC5-80-720:

Emission Unit No.	Emission Unit Description	Citation-	Pollutant Emitted (5-80-720 B.)	Rated Capacity (5-80-720 C.)
T1 – T8	Engine Oil Day Tanks - WMRE	5-80-720C	VOC	25 gallons
T9	Engine Oil Tank - WMRE	5-80-720C	VOC	1,500 gallons
T10	Engine Used Oil Day Tank - WMRE	5-80-720C	VOC	1,500 gallons

Emission Unit No.	Emission Unit Description	Citation-	Pollutant Emitted (5-80-720 B.)	Rated Capacity (5-80-720 C.)
T11	Engine Coolant Tank - WMRE	5-80-720C	VOC	750 gallons
CBV-1-8	Crankcase Breather Vents – WMRE (Hilco Mist Eliminator)	5-80-720C	PM	NA
GC1	Gas Chromatograph (in gas plant)	5-80-720C	VOC	NA
LP-1	Light Plant (Almand) Landfill or Shop	5-80-720C	NOx, CO, VOC, SOx, PM, HAPs	6 Kw
LP-2	Light Plant (Coleman) Landfill or Shop	5-80-720C	NOx, CO, VOC, SOx, PM, HAPs	20 Kw
AST1	Above Ground Diesel Fuel Storage Tank - Mobile	5-80-720.C	VOC/HAPs	2,600 gallons
AST2	Used Oil Tank – Convenience Center	5-80-720.C	VOC/HAPs	550 gallons
AST3	Hydraulic Fluid Storage Tank	5-80-720.C	VOC/HAPs	500 gallons
AST4	Used Oil Tank	5-80-720.C	VOC/HAPs	500 gallons
AST5	Transmission Fluid Storage Tank	5-80-720.C	VOC/HAPs	250 gallons
AST6	Motor Oil Tank	5-80-720.C	VOC/HAPs	500 gallons
AST7	Transmission Fluid Storage Tank	5-80-720.C	VOC/HAPs	250 gallons
LT-8	Leachate Storage Tank	5-80-720.C	VOC/HAPs	500,000 gallons
LT-9	Leachate Storage Tank	5-80-720.C	VOC/HAPs	500,000 gallons
AST-14	Leachate Storage Tank	5-80-720.C	VOC/HAPs	11,000 gallons
AST-15	AST containing septic waste	5-80-720.C	N/A	25,000 gallons
AST-22	AST containing propane	5-80-720.C	VOC/HAPs	1,000 gallons
AST-23	Diesel Fuel Storage Tank – Split Tank	5-80-720.C	VOC/HAPs	12,000 gallons
AST-24	AST containing propane	5-80-720.C	VOC/HAPs	120 gallons

Emission Unit No.	Emission Unit Description	Citation-	Pollutant Emitted (5-80-720 B.)	Rated Capacity (5-80-720 C.)
AST-26	Diesel Fuel Storage Tank for BG-2	5-80-720.C	VOC/HAPs	660 gallons
AST-27	Diesel Fuel Storage Tank for GEN-1	5-80-720.C	VOC/HAPs	5 gallons
AST-28	Diesel Fuel Storage Tank for GEN-2	5-80-720.C	VOC/HAPs	5 gallons
WELD-1	Welding Equipment (Mobile Truck)	5-80-720.C	PM	8 Kw
Liquifix-1	Liquid Stabilization Tank	5-80-720.C	PM/VOC/HAPs	13,644 gallons
Liquifix-2	Liquid Stabilization Tank	5-80-720.C	PM/VOC/HAPs	13,644 gallons
PW-1 *	Parts Washer with Lid (Closed)	5-80-720.C	VOC/HAPs	20 gallons

These emission units are presumed to be in compliance with all requirements of the federal Clean Air Act as may apply. Based on this presumption, no monitoring, recordkeeping, or reporting shall be required for these emission units in accordance with 9VAC5-80-110. (9VAC 5-80-110 and Condition 1 of the NSR Permit dated 08/07/2017)

65. Permit Shield & Inapplicable Requirements - Compliance with the provisions of this permit shall be deemed compliance with all applicable requirements in effect as of the permit issuance date as identified in this permit. This permit shield covers only those applicable requirements covered by terms and conditions in this permit and the following requirements which have been specifically identified as being not applicable to this permitted facility:

Citation	Title of Citation	Description of Applicability
9 VAC 5-40-5800 and 40 CFR 60 subpart Cc	Emission Standards and Emission Guidelines for Sanitary Landfills	These regulations only apply to municipal solid waste landfills, which commenced construction, reconstruction or modification before May 30 1991.
40 CFR 60 subpart Kb	Volatile Organic Liquid Storage Vessels	The leachate storage tanks have a vapor pressure below the 40 CFR 60 Subpart Kb thresholds. NSPS Subpart Kb does not apply based on the size of the all other listed tanks and from recordkeeping requirements as revised on October 13, 2003.
40 CFR 64	Compliance Assurance Monitoring	The Landfill is subject to an NSPS that was proposed after 11/15/1990. Therefore, this regulation does not apply. Compliance Assurance Monitoring, 40 CFR Part 64, does not apply to the facility SI RICE do <u>not</u> have add-on pollution control devices.
40 CFR 75	Acid Rain Regulations	This landfill does not have a "Qualifying Facility."
40 CFR Parts 51, 52, 70 and 71	Title V Greenhouse Gas Tailoring Rule,	Title V Greenhouse Gas Tailoring Rule, 40 CFR Parts 51,52,70 and 71, does not apply to the facility as it is an existing source not subject to PSD for any pollutant (until any increase in CO in the future).

Citation	Title of Citation	Description of Applicability
MACT Subpart A - 40 CFR Part 63.6(d), 63.6(e), 63.6(h), 63.7(e)(1), 63.8(a)(4), 63.8(c)(5), 63.9(d), 63.10(b)(2)(i)-(v), 63.10(d)(3), 63.1(e)(2)(iii), 63.10(e)(4), and 63.11	General Provisions	Facility is exempted by complying with MACT Subpart ZZZZ requirements.
9 VAC 5-40-20 A.4	startup, shut down, and malfunction opacity exclusion	The startup, shut down, and malfunction opacity exclusion listed in 9 VAC 5-40-20 A.4 cannot be included in any Title V permit. This portion of the regulation is not part of the federally approved state implementation plan. The opacity standard applies to existing sources at all times including startup, shutdown, and malfunction. Opacity exceedances during malfunction can be affirmatively defended provided all requirements of the affirmative defense section of this permit are met. Opacity exceedances during startup and shut down will be reviewed with enforcement discretion using the requirements of 9 VAC 5-40-20 E, which state that "At all times, including periods of startup, shutdown, soot blowing and malfunction, owners shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with air pollution control practices for minimizing emissions."
Existing Source Rule 4-8 (9 VAC 5-40-880)	Emission Standards for Fuel Burning Equipment	"E. The provisions of this article do not apply to stationary internal combustion engines."

Nothing in this permit shield shall alter the provisions of §303 of the federal Clean Air Act, including the authority of the administrator under that section, the liability of the owner for any violation of applicable requirements prior to or at the time of permit issuance, or the ability to obtain information by (i) the administrator pursuant to §114 of the federal Clean Air Act, (ii) the Board pursuant to §10.1-1314 or §10.1-1315 of the Virginia Air Pollution Control Law or (iii) the Department pursuant to §10.1-1307.3 of the Virginia Air Pollution Control Law.
(9VAC5-80-110 and 9VAC5-80-140)

General Conditions

66. General Conditions - Federal Enforceability - All terms and conditions in this permit are enforceable by the administrator and citizens under the federal Clean Air Act, except those that have been designated as only state-enforceable.
(9VAC5-80-110)
67. General Conditions - Permit Expiration –
- a. This permit has a fixed term of five years. The expiration date shall be the date five years from the date of issuance. Unless the owner submits a timely and complete application for renewal to the Department consistent with the requirements of 9VAC5-80-80, the right of the facility to operate shall be terminated upon permit expiration.
 - b. The owner shall submit an application for renewal at least six months but no earlier than eighteen months prior to the date of permit expiration.
 - c. If an applicant submits a timely and complete application for an initial permit or renewal under 9VAC5-80-80 F, the failure of the source to have a permit or the operation of the source without a permit shall not be a violation of Article 1, Part II of 9VAC5 Chapter 80, until the Board takes final action on the application under 9VAC5-80-150.
 - d. No source shall operate after the time that it is required to submit a timely and complete application under subsections C and D of 9VAC5-80-80 for a renewal permit, except in compliance with a permit issued under Article 1, Part II of 9VAC5 Chapter 80.
 - e. If an applicant submits a timely and complete application under section 9VAC5-80-80 for a permit renewal but the Board fails to issue or deny the renewal permit before the end of the term of the previous permit, (i) the previous permit shall not expire until the renewal permit has been issued or denied and (ii) all the terms and conditions of the previous permit, including any permit shield granted pursuant to 9VAC5-80-140, shall remain in effect from the date the application is determined to be complete until the renewal permit is issued or denied.
 - f. The protection under subsections F 1 and F 5 (ii) of section 9VAC5-80-80 F shall cease to apply if, subsequent to the completeness determination made pursuant section 9VAC5-80-80 D, the applicant fails to submit by the deadline specified in writing by the Board any additional information identified as being needed to process the application.
- (9VAC5-80-80, 9VAC5-80-110 and 9VAC5-80-170)
68. General Conditions -Recordkeeping and Reporting - All records of monitoring information maintained to demonstrate compliance with the terms and conditions of this permit shall contain, where applicable, the following:
- a. The date, place as defined in the permit, and time of sampling or measurements;

- b. The date(s) analyses were performed;
- c. The company or entity that performed the analyses;
- d. The analytical techniques or methods used;
- e. The results of such analyses; and
- f. The operating conditions existing at the time of sampling or measurement.

(9VAC5-80-110)

69. General Conditions -Recordkeeping and Reporting - Records of all monitoring data and support information shall be retained for at least five years from the date of the monitoring sample, measurement, report, or application. Support information includes all calibration and maintenance records and all original strip-chart recordings for continuous monitoring instrumentation, and copies of all reports required by the permit.
(9VAC5-80-110)

70. General Conditions -Recordkeeping and Reporting - The permittee shall submit the results of monitoring contained in any applicable requirement to DEQ no later than March 1 and September 1 of each calendar year. This report must be signed by a responsible official, consistent with 9 VAC5-80-430 G, and shall include:

- a. The time period included in the report. The time periods to be addressed are January 1 to June 30 and July 1 to December 31; and
- b. All deviations from permit requirements. For purpose of this permit, deviations include, but are not limited to:
 - i. Exceedances of emissions limitations or operational restrictions;
 - ii. Excursions from control device operating parameter requirements, as documented by continuous emission monitoring or periodic monitoring, or Compliance Assurance Monitoring (CAM) which indicates an exceedance of emission limitations or operational restrictions; or,
 - iii. Failure to meet monitoring, recordkeeping, or reporting requirements contained in this permit.
- c. If there were no deviations from permit conditions during the time period, the permittee shall include a statement in the report that "no deviations from permit requirements occurred during this semi-annual reporting period."

(9VAC5-80-110)

71. General Conditions - Annual Compliance Certification - Exclusive of any reporting required to assure compliance with the terms and conditions of this permit or as part of a schedule of compliance contained in this permit, the permittee shall submit to EPA and DEQ no later

than March 1 each calendar year a certification of compliance with all terms and conditions of this permit including emission limitation standards or work practices for the period ending December 31. The compliance certification shall comply with such additional requirements that may be specified pursuant to § 114(a)(3) and § 504(b) of the federal Clean Air Act. The permittee shall maintain a copy of the certification for five (5) years after submittal of the certification. This certification shall be signed by a responsible official, consistent with 9VAC5-80-430 G, and shall include:

- a. The time period included in the certification. The time period to be addressed is January 1 to December 31;
- b. The identification of each term or condition of the permit that is the basis of the certification;
- c. The compliance status;
- d. Whether compliance was continuous or intermittent, and if not continuous, documentation of each incident of non-compliance;
- e. Consistent with subsection 9VAC5-80-490 E, the method or methods used for determining the compliance status of the source at the time of certification and over the reporting period;
- f. Such other facts as the permit may require to determine the compliance status of the source; and
- g. One copy of the annual compliance certification shall be submitted to EPA in electronic format only. The certification document should be sent to the following electronic mailing address:

R3_APD_Permits@epa.gov

(9VAC5-80-110)

72. General Conditions - Permit Deviation Reporting - The permittee shall notify the Piedmont Regional Office within four daytime business hours after discovery of any deviations from permit requirements which may cause excess emissions for more than one hour, including those attributable to upset conditions as may be defined in this permit. In addition, within 14 days of the discovery, the permittee shall provide a written statement explaining the problem, any corrective actions or preventative measures taken, and the estimated duration of the permit deviation. The occurrence should also be reported in the next semi-annual compliance monitoring report pursuant to Condition 67 of this permit.
(9VAC5-80-110 F. 2)
73. General Conditions - Failure/Malfunction Reporting - In the event that any affected facility or related air pollution control equipment fails or malfunctions in such a manner that may cause excess emissions for more than one hour, the owner shall no later than four daytime business hours after the malfunction is discovered, notify the Piedmont Regional Office such failure or malfunction and within 14 days provide a written statement giving all pertinent

facts, including the estimated duration of the breakdown. Owners subject to the requirements of 9VAC5-40-50 C and 9VAC5-50-50 C are not required to provide the written statement prescribed in this paragraph for facilities subject to the monitoring requirements of 9VAC5-40-40 and 9VAC5-50-40. When the condition causing the failure or malfunction has been corrected and the equipment is again in operation, the owner shall notify the Piedmont Regional Office.
(9VAC5-80-110 and 9VAC5-20-180)

74. General Conditions - Severability - The terms of this permit are severable. If any condition, requirement or portion of the permit is held invalid or inapplicable under any circumstance, such invalidity or inapplicability shall not affect or impair the remaining conditions, requirements, or portions of the permit.
(9VAC5-80-110)
75. General Conditions - Duty to Comply - The permittee shall comply with all terms and conditions of this permit. Any permit noncompliance constitutes a violation of the federal Clean Air Act or the Virginia Air Pollution Control Law or both and is ground for enforcement action; for permit termination, revocation and reissuance, or modification; or, for denial of a permit renewal application.
(9VAC5-80-110)
76. General Conditions - Need to Halt or Reduce Activity not a Defense - It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
(9VAC5-80-110)
77. General Conditions - Permit Modification - A physical change in, or change in the method of operation of, this stationary source may be subject to permitting under State Regulations 9VAC5-80-50, 9VAC5-80-1100, 9VAC5-80-1605, or 9VAC5-80-2000 and may require a permit modification and/or revisions except as may be authorized in any approved alternative operating scenarios.
(9VAC80-110, 9VAC5-80-190 and 9VAC5-80-260)
78. General Conditions - Property Rights - The permit does not convey any property rights of any sort, or any exclusive privilege.
(9VAC5-80-110)
79. General Conditions - Duty to Submit Information - The permittee shall furnish to the Board, within a reasonable time, any information that the Board may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit or to determine compliance with the permit. Upon request, the permittee shall also furnish to the Board copies of records required to be kept by the permit and, for information claimed to be confidential, the permittee shall furnish such records to the Board along with a claim of confidentiality.
(9VAC5-80-110)

80. General Conditions - Duty to Submit Information - Any document (including reports) required in a permit condition to be submitted to the Board shall contain a certification by a responsible official that meets the requirements of 9VAC5-80-80 G.
(9VAC5-80-110)
81. General Conditions - Duty to Pay Permit Fees - The owner of any source for which a permit under 9VAC5-80-50 through 9VAC5-80-300 was issued shall pay permit fees consistent with the requirements of 9VAC5-80-310 through 9VAC5-80-350 in addition to an annual permit maintenance fee consistent with the requirements of 9VAC5-80-2310 through 9VAC5-80-2350. The actual emissions covered by the permit program fees for the preceding year shall be calculated by the owner and submitted to the Department by April 15 of each year. The calculations and final amount of emissions are subject to verification and final determination by DEQ. The amount of the annual permit maintenance fee shall be the largest applicable base permit maintenance fee amount from Table 8-11A in 9VAC5-80-2340, adjusted annually by the change in the Consumer Price Index.
(9VAC5-80-110, 9VAC5-80-340 and 9VAC5-80-2340)
82. General Conditions - Fugitive Dust Emission Standards - During the operation of a stationary source or any other building, structure, facility, or installation, no owner or other person shall cause or permit any materials or property to be handled, transported, stored, used, constructed, altered, repaired, or demolished without taking reasonable precautions to prevent particulate matter from becoming airborne. Such reasonable precautions may include, but are not limited to, the following:
- a. Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land;
 - b. Application of asphalt, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which may create airborne dust; the paving of roadways and the maintaining of them in a clean condition;
 - c. Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty material. Adequate containment methods shall be employed during sandblasting or similar operations;
 - d. Open equipment for conveying or transporting material likely to create objectionable air pollution when airborne shall be covered or treated in an equally effective manner at all times when in motion; and,
 - e. The prompt removal of spilled or tracked dirt or other materials from paved streets and of dried sediments resulting from soil erosion.
- (9VAC5-80-110 and [9VAC5-40-90 or 9VAC5-50-90])
83. General Conditions - Startup, Shutdown, and Malfunction - At all times, including periods of startup, shutdown, and soot blowing, and malfunction, owners shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with air pollution control practices for minimizing

emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Board, which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.
(9VAC5-80-110 and [9VAC5-50-20 E or 9VAC5-40-20 E])

84. General Conditions - Alternative Operating Scenarios - Contemporaneously with making a change between reasonably anticipated operating scenarios identified in this permit, the permittee shall record in a log at the permitted facility a record of the scenario under which it is operating. The permit shield described in 9VAC5-80-140 shall extend to all terms and conditions under each such operating scenario. The terms and conditions of each such alternative scenario shall meet all applicable requirements including the requirements of 9VAC5 Chapter 80, Article 1.
(9VAC5-80-110)
85. General Conditions - Inspection and Entry Requirements - The permittee shall allow DEQ, upon presentation of credentials and other documents as may be required by law, to perform the following:
 - a. Enter upon the premises where the source is located or emissions-related activity is conducted, or where records must be kept under the terms and conditions of the permit.
 - b. Have access to and copy, at reasonable times, any records that must be kept under the terms and conditions of the permit.
 - c. Inspect at reasonable times any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under the permit.
 - d. Sample or monitor at reasonable times' substances or parameters for the purpose of assuring compliance with the permit or applicable requirements.
(9VAC5-80-110)
86. General Conditions - Reopening for Cause - The permit shall be reopened by the Board if additional federal requirements become applicable to a major source with a remaining permit term of three years or more. Such reopening shall be completed no later than 18 months after promulgation of the applicable requirement. No such reopening is required if the effective date of the requirement is later than the date on which the permit is due to expire, unless the original permit or any of its terms and conditions has been extended pursuant to 9VAC5-80-80 F. The conditions for reopening a permit are as follows:
 - a. The permit shall be reopened if the Board or the administrator determines that the permit contains a material mistake or that inaccurate statements were made in establishing the emissions standards or other terms or conditions of the permit.

- b. The permit shall be reopened if the administrator or the Board determines that the permit must be revised or revoked to assure compliance with the applicable requirements.
- c. The permit shall not be reopened by the Board if additional applicable state requirements become applicable to a major source prior to the expiration date established under 9VAC5-80-110 D.

(9VAC5-80-110)

87. General Conditions - Permit Availability - Within five days after receipt of the issued permit, the permittee shall maintain the permit on the premises for which the permit has been issued and shall make the permit immediately available to DEQ upon request.
(9VAC5-80-110 and 9VAC5-80-150)

88. General Conditions - Transfer of Permits

- a. No person shall transfer a permit from one location to another, unless authorized under 9VAC5-80-130, or from one piece of equipment to another.
- b. In the case of a transfer of ownership of a stationary source, the new owner shall comply with any current permit issued to the previous owner. The new owner shall notify the Board of the change in ownership within 30 days of the transfer and shall comply with the requirements of 9VAC5-80-200.
- c. In the case of a name change of a stationary source, the owner shall comply with any current permit issued under the previous source name. The owner shall notify the Board of the change in source name within 30 days of the name change and shall comply with the requirements of 9VAC5-80-200.

(9VAC5-80-110 and 9VAC5-80-160)

89. General Conditions - Permit Revocation or Termination for Cause - A permit may be revoked or terminated prior to its expiration date if the owner knowingly makes material misstatements in the permit application or any amendments thereto or if the permittee violates, fails, neglects or refuses to comply with the terms or conditions of the permit, any applicable requirements, or the applicable provisions of 9VAC5 Chapter 80 Article 1. The Board may suspend, under such conditions and for such period of time as the Board may prescribe any permit for any grounds for revocation or termination or for any other violations of these regulations.

(9VAC5-80-110, 9VAC5-80-190 C and 9VAC5-80-260)

90. General Conditions - Duty to Supplement or Correct Application - Any applicant who fails to submit any relevant facts or who has submitted incorrect information in a permit application shall, upon becoming aware of such failure or incorrect submittal, promptly submit such supplementary facts or corrections. An applicant shall also provide additional information as necessary to address any requirements that become applicable to the

source after the date a complete application was filed but prior to release of a draft permit.
(9VAC5-80-110 and 9VAC5-80-80 E)

91. General Conditions - Stratospheric Ozone Protection - If the permittee handles or emits one or more Class I or II substances subject to a standard promulgated under or established by Title VI (Stratospheric Ozone Protection) of the federal Clean Air Act, the permittee shall comply with all applicable sections of 40 CFR Part 82, Subparts A to F.
(9VAC5-80-110 and 40 CFR Part 82)
92. General Conditions - Asbestos Requirements - The permittee shall comply with the requirements of National Emissions Standards for Hazardous Air Pollutants (40 CFR 61) Subpart M, National Emission Standards for Asbestos as it applies to the following: Standards for Demolition and Renovation (40 CFR 61.145), Standards for Insulating Materials (40 CFR 61.148), and Standards for Waste Disposal (40 CFR 61.150).
(9VAC5-60-70 and 9VAC5-80-110)
93. General Conditions - Accidental Release Prevention - If the permittee has more, or will have more than a threshold quantity of a regulated substance in a process, as determined by 40 CFR 68.115, the permittee shall comply with the requirements of 40 CFR Part 68.
(9VAC5-80-110 and 40 CFR Part 68)
94. General Conditions - Changes to Permits for Emissions Trading - No permit revision shall be required under any federally approved economic incentives, marketable permits, emissions trading and other similar programs or processes for changes that are provided for in this permit.
(9VAC5-80-110)
95. General Conditions - Emissions Trading - Where the trading of emissions increases and decreases within the permitted facility is to occur within the context of this permit and to the extent that the regulations provide for trading such increases and decreases without a case-by-case approval of each emissions trade:
 - a. All terms and conditions required under 9VAC5-80-110, except subsection N, shall be included to determine compliance.
 - b. The permit shield described in 9VAC5-80-140 shall extend to all terms and conditions that allow such increases and decreases in emissions.
 - c. The owner shall meet all applicable requirements including the requirements of 9VAC5-80-50 through 9VAC5-80-300.

(9VAC5-80-110)

State-Only Enforceable Requirements

The following terms and conditions are not required under the federal Clean Air Act or under any of its applicable federal requirements, and are not subject to the requirements of 9VAC5-80-290 concerning review of proposed limits by EPA and draft permits by affected states.

96. State-Only Enforceable Requirements - Odor Management Plan - The Odor Management and Control Plan describing the practices and technology that will be used to minimize off-site odors and to address odor complaints that may occur shall be an enforceable part of this permit. The plan shall incorporate the use of best available odor control technology that is appropriate for this landfill. The plan shall also describe procedures that will be implemented in response to citizen odor complaints or the detection of significant off-site odors by DEQ staff, including progressive steps that will be taken to reduce odors. A log of all odor complaints received and actions taken shall be kept and made available for inspection by authorized Federal, State or Local officials. The Odor Management and Control Plan shall be reviewed annually by the Facility and evaluated for the need and feasibility of new or modified odor control technology or practices. Results of the annual plan review, a modified plan (Both optional submittals) and a copy of the log shall be submitted to the Piedmont Regional Office by the first day of March of each year.
(9 VAC 5-80-110 and condition 31 of the NSR Permit dated 08/07/2017)

APPENDIX E

ODOR MANAGEMENT PLAN



ODOR MANAGEMENT PLAN

**MIDDLE PENINSULA LANDFILL AND RECYCLING FACILITY
GLENNS, VIRGINIA**

**APRIL 2008
Last Revised March 2020**

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SECTION 1 - INTRODUCTION

The purpose of this Odor Management Plan is to describe the practices and technology that will be used to minimize off-site odors and to address odor complaints that may occur. The plan incorporates the Middle Peninsula Landfill and Recycling Facility (MPLRF) use of best available odor control technology that is appropriate for this type of facility. This plan establishes responsibilities and procedures for collecting data pertinent to odor control and defines methods for responding to odor generation and complaints.

This plan is divided into six main sections. Section 1 is the introduction. Section 2 deals with site assessment and preparation in order to evaluate the landfill. Section 3 describes the technology and practices used by the facility to manage the gas and control odorous emissions. Section 4 describes the components of an effective odor-surveying program designed to detect off-site odors and enable the facility to proactively manage odors. Section 5 outlines procedures for handling and responding to odor complaints. Section 6 includes record keeping and reporting procedures for documentation regarding odor management activities and complaints.

The implementation of this plan will improve odor management at our facilities while also maintaining a positive perception of our operations by our communities. This will result in moving toward our goal of being a “neighbor of choice” now and in the future.

SECTION 2 – SITE EVALUATION AND PREPARATION

Middle Peninsula Landfill and Recycling Facility (MPLRF) shall take the following steps to prevent off-site odors

General Odor Evaluation

MPLRF shall identify common odor sources at the site and the need for any current or reasonably anticipated future odor control activities or devices. This evaluation should include items such as:

- Landfill daily and intermediate cover practices
- Identification of facility employees responsible for conducting the assessment and coordinating the odor management activities.
- Proximity of landfill operations and/or any other potential odor sources to the property boundary and receptors.
- Short-term activities such as gas well installation, waste excavation.
- New waste streams with odor characteristics that differ from current waste streams.
- The need for gas system upgrades (e.g., new wells, placing leachate risers, clean-outs, or manholes under vacuum, etc.) or repairs.
- New on-site or off-site operations (such as solidification) that may generate odors.
- The size of the working face operations.
- Leachate recirculation, precipitation, and the effects of wet waste on odor generation
- The effects of damaged wells, and timeliness of damaged wells being repaired.
- Investigate if any flare outages have occurred due to construction, malfunction, or system modifications.

These informal and formal evaluations are ongoing and the results of these evaluations will be incorporated into the Odor Management Plan. Odor Management Plan updates will be conducted as operations change in manners that may impact the generation of odors, but no less than annually.

Weather Data Collection

MPLRF utilized internet resources and/or an on-site rain gauge to document local meteorological data. Data available includes:

- Wind Direction and Speed

- Rainfall/Precipitation Amounts
- Temperature
- Barometric Pressure
- Humidity

The District Manager will use the available weather data and site operations data as a tool to determine the potential for future off-site odors, and evaluate the likelihood of off-site sources as the cause for a complaint.

Site Vicinity Map

MPLRF maintains site vicinity map/photos. The maps are to a known scale, show landfill waste areas and property boundaries, and encompass an area surrounding the facility sufficient to depict locations that may be impacted by any odors which might be generated at the facility. The site vicinity maps shall show the following features:

- Landfill facility location, property boundary, landfill waste areas, and surrounding areas.
- Improvements at the facility (e.g., rail receiving areas, wastewater treatment plants, LFG management systems, composting facilities, yard waste handling areas, etc.).
- Off-site facilities/locations that have the potential to generate odors (e.g., POTW's, manufacturing facilities, farms, areas of land application of sludges, etc.).
- Key streets and other landmarks as well as odor survey points.

Complaint Call Procedure

MPLRF has developed a procedure for handling odor complaints, which includes the following:

- The District Manager and designated alternates shall receive all complaint calls. The site contact number of 804-693-5109 should be called, which would be directed to the District Manager or designated alternate. During off hours, MPLRF uses an automated telephone system, which provides the District Manager's phone number. The District Manager's extension will also be referenced in the voice mail greeting to facilitate calls. The emergency telephone number is posted at the gate of the landfill.
- MPLRF has developed a site-specific list of discussion points to be followed as a guide during complaint calls. The District Manager will also provide training to alternates relating to appropriate procedures when handling odor complaints. An example of

discussion points and information to be collected during a response call is provided in Attachment 1.

- Electronic documentation of any odor complaint is maintained in the Waste Management Public Comment Management System.

SECTION 3 – LANDFILL PRACTICES AND TECHNOLOGY

MPLRF has implemented the following best management practices and Best Available Control Technology (BACT) for the collection and control of landfill gas and odors. These include the following:

Landfill Gas Collection And Control System

MPLRF has installed a state-of-the-art Landfill Gas (LFG) collection and control system (GCCS) that collects the landfill gas and either sends it to the flares (considered BACT for landfill gas) or to a treatment system that treats the gas for beneficial use as fuel. Important elements of the GCCS are the following:

- Horizontal and vertical gas extraction devices (wells) are installed into the waste mass to collect the LFG in the most efficient manner.
- New wells are drilled, and then piping installed and connected to the collection system as soon as possible to capture escaping gas.
- Wells that are damaged are repaired as soon as safely possible. If wells are damaged or operations exist to an extent that would prevent the wells from being repaired, the wells are capped and the adjacent wells are increased in vacuum.
- Leachate collection system LFG control devices (e.g.: leachate risers, leachate cleanouts, etc.) are connected to the GCCS to maximize gas collection and minimize odors.
- Other collection points such as cap vents or horizontal pipes in the bottom of the cell and at the edge of cell berms are incorporated in to the GCCS. MPLRF has connected additional pipe penetrations that could allow LFG to escape into the GCCS. This further reduces odorous emissions by maximizing the collection of gas while minimizing areas from which the gas could escape.
- The facility has two blowers designed to apply vacuum to the well field. The blower system is designed to send gas to the treatment system, the flares, or both. The capacity of the GCCS is increased in accordance with the facility's development and air permit; to stay ahead of the gas produced by the landfill, thereby reducing emissions.

Odor Neutralizing Systems

MPLRF has several stationary odor neutralizing systems. The system consists of a delivery system that dispenses an odor neutralizer. The odor neutralizer is a proprietary mixture of essential oils, surfactants, and other compounds designed to bind with odor molecules to make them heavier than air and therefore fall to the ground rather than remaining airborne. The system can be moved around the site as needed to reduce odors. In addition to the stationary system, a portable

deodorizing machine could be deployed to the site, from another Waste Management facility, to assist in reducing odors.

Landfill Cover Integrity

MPLRF applies cover in accordance with the Virginia Solid Waste Management Regulations (VSWMR). The facility monitors the condition of the cover to ensure that it minimizes odor and provides better capture efficiency of the GCCS. The cover consists of:

- Daily cover consisting of 6 inches of compacted soil or other materials approved by the VADEQ as alternate daily cover;
- Intermediate cover which consists of an additional 6 inches of compacted soils; and
- Geomembrane interim covers.

MPLRF uses soil-mined onsite for daily and intermediate cover. The soil found on the landfill property has excellent properties to provide an exceptional seal to lock in the gas and further enhance the efficiency of the GCCS.

The integrity of the cover is evaluated regularly by one of the following: the district manager, environmental manager or gas technician. The thickness of the cover soils are adjusted accordingly to prevent emissions and odors.

General

These systems are continuously monitored and evaluated. These evaluations are discussed during the regularly scheduled staff meetings with facility management, operations, gas operations, environmental protection, engineering, and technical personnel. The purpose of these meetings is to ensure all personnel work in harmony so that waste is managed in a safe, environmentally friendly fashion while allowing the GCCS to be maintained and upgraded. During the meeting personnel discuss all site concerns to include gas management, operational issues, equipment maintenance schedules, GCCS upgrades, and the control of any issue that may contribute to decreased gas collection efficiency and odorous emission increases, as well as other site issues.

SECTION 4 – ODOR SURVEY PROGRAM

MPLRF has developed and implemented an odor survey program. The program includes the following:

Training

The District Manager and designated alternates will attend training on the monitoring and detection of odors in accordance with standard practices and procedures. There will be an annual refresher session for those initially trained. The District Manager may appoint a contractor as a designated alternate.

Odor Survey Points

A network of survey points at which odor shall be monitored on a schedule has been established pursuant to the Odor Survey Plan set forth below. Survey points are located at or beyond the landfill property at locations selected based on predominant wind direction, location of receptors, proximity of operations to landfill property boundary, and such other factors deemed relevant by facility management. Odor survey points are clearly identified and recorded in a file as well as located on the site vicinity map (attached as Attachment 2).

Odor Survey Plan

Routine odor surveys will be conducted once per week by trained site personnel. Upon receiving a complaint, the District Manager (DM) or his designees shall conduct an odor survey at odor survey points. The survey points were selected after careful consideration of topography, prevailing wind direction, variable wind direction, and population centers. The following items shall be addressed when conducting the odor survey.

- Only trained personnel shall conduct the routine odor surveys.
- At each survey point, the DM or designees shall follow the procedures for odor identification and indicate findings on Field Odor Survey Forms found in Attachment 3.
- At each odor Survey Point, the DM or designees shall note any odors detected from nearby off-site sources or observations of any activities at nearby off-site sources that may generate odors.
- The DM or designees shall complete the Field Odor Survey Form at the time of each survey, except that the sections relating to weather conditions may be completed in the office. The Field Odor Survey Form shall be retained at the site for a period of at least three years. See Attachment 3 for these forms.

SECTION 5 – COMPLAINT HANDLING PROCEDURES

Each site shall follow the procedures given below when responding to odor issues.

Odor Complaint Processing

- When an odor complaint is received, it shall be routed to the District Manager or designated alternates.
- Upon receipt of an odor complaint call, the District Manager or designated alternates shall discuss the odor issue with the caller using the information from Attachment 1 as a guide during the conversation. The District Manager or alternate shall ask the caller if he/she would like a follow-up phone call.
- At the time the complaint is received, the District Manager or designated alternates shall document the complaint in the Waste Management Public Comment System.

Follow-Up

Once an odor complaint has been received, the District Manager or alternate shall:

- When possible, perform the odor survey and document results.
- Check weather station data for wind speed and direction on date and time that the caller reportedly detected odors. Record weather data for wind speed and direction.
- When possible, visit the location of the complaint as soon as possible after the complaint is received.
- If the caller indicated that he/she would like a follow-up phone call, the follow-up call should include the following information:
 - Confirm the Company investigated the odor,
 - Indicate the steps taken (or to be taken) at the landfill to address the odor complaint.
 - Reinforce that MPLRF views the call as important and will result in action to identify and remedy the issue. Invite the caller to call back with any further questions.
 - Invite the caller for a tour of the facility.
 - List -within the Public Comment System all-corrective measures taken.
- Check the flare area for gas flow and available vacuum,

- Have field personnel check the GCCS and odor control system to ensure that the equipment is operational. This may include but not be limited to:
 - available vacuum to the well field
 - flow to the flares and/or the treatment system
 - check individual wells for proper balancing
 - check the available vacuum to the individual wells
 - check the flow of water to the odor neutralizer
 - check the level of neutralizing agent
 - check the concentration setting of the neutralizer
 - ensure the nozzles are not clogged
 - check any filters on the neutralizer for clogging
 - check the flow rate of water through the system
- Have operations personnel evaluate the integrity of cover soils to ensure proper cover is in place to prevent odors.
- Determine the actual working conditions present during the complaint i.e.: acceptance of sludges or other objectionable smelling wastes, working face size, wind direction with respect to the working face.
- Electronic documentation of any odor complaints are maintained in the Waste Management Public Comment Management System.

Site Response

When an odor complaint or series of complaints are received, the District Manager or designated alternate shall:

- Perform the odor survey and document the results.
- Compare present odor complaint(s) to any past odor complaints. Identify any correlation between the current complaint and any past complaints (e.g., do the complaints come at a specific time of day or when a specific operation is taking place on the site?).
- Evaluate potential on-site sources for the cause of the odor complaint.
- Evaluate potential off-site sources for the cause of the odor complaint.
- Evaluate the acceptance of particularly objectionable wastes including limiting or cessation of acceptance
- Evaluate the location of the mobile neutralizer system and possible relocation

- Evaluate the size of the working face against the incoming rate of tonnage, is it appropriate for the amount of waste being accepted.
- Evaluate the condition of cover. Inspect for ruts, gaps, inadequate thickness, appropriate materials, apply greater thickness material, and the use of ADC.
- In the case of persistent odor problems, for which all other remedies fail, the District Manager will schedule a Surface Emissions Monitoring (SEM). The SEM will be for the purpose of determining potential odor sources to include areas of the landfill that are not applicable to NSPS WWW. Any areas that are NSPS WWW applicable with surface emissions will be handled in accordance with NSPS WWW, all other areas will be addressed on a time line that ensures that the odors will be reduced/eliminated but ensures the safety of all personnel involved.
- Identify any necessary corrective measures and evaluate feasibility.
- Implement corrective measures deemed necessary. Record corrective measures in the Waste Management Public Comment Management System.

SECTION 6 – RECORDKEEPING AND REPORTING

The site shall maintain on-site the Field Odor Survey Form, and any other documentation required by this Plan for at least a 12-month period. Information up to three years shall be retained and Forms older than 12 months old may be transferred to an off-site storage facility.

The District Manager and Environmental Protection Manager shall review the Waste Management Public Comment Management System on a regular basis and discuss any corrective measures implemented and/or recommended during that quarter.

A log of all odor complaints received and actions taken will be maintained on the Waste Management Public Comment Management System and made available for inspection by authorized Federal, State or Local officials. A copy of the log entries for each semi-annual period (January-June and July-December) will be sent to the Director, Piedmont Regional Office, within 10 days of the close of that semi-annual period and the Odor Management Plan Annual Review will be submitted to the Director, Piedmont Regional Office by March 1 of each year.

The District Manager will maintain a record of the actions taken to address an odor complaint. This record will document the actions taken, the rationale for any deviations from the plan, and whether the steps taken were deemed effective in addressing the odor issue. A copy of the action report will be maintained electronically in the Waste Management Public Comment Management System.

The Odor Management Plan will be reviewed at least annually by MPLRF and evaluated for the need and feasibility of new or modified odor control technology or practices. The items reviewed shall include but not be limited to:

- Effectiveness of in-place soils as adequate cover materials
- Effect use of intermediate cover i.e.: should materials be placed thicker, alternate materials, frequency of inspection
- Well density in the landfill
- Well effectiveness: are more wells needed in some areas and some taken out of others, proper placement of wells
- Adequate vacuum availability, does blower capacity need to be increased
- Does the quantity of leachate being recirculated need to be adjusted
- Odor survey points: increase number, adjust locations, alternate routes, change the route
- Effectiveness of odor neutralizer: appropriate concentrations, appropriate neutralizer, increasing/decreasing number of nozzles, changing location of permanent system
- Changes to Odor survey: frequencies, personnel, routes
- Complaint handling, is it effective in resolving complainants issues
- Newer technologies available, are they feasible and economically worthwhile
- Gas well design: vertical wells vs. horizontal collectors vs. gas trenches or other emerging technology
- Changes in operations that affect odors
- Workface practices that attribute to odors
- Use of odor masking agents

ATTACHMENT 1 - LIST OF DISCUSSION POINTS

DISCUSSION POINTS AND QUESTIONS FOR COMPLAINT CALLS

When answering a complaint call:

- Get caller's name address and telephone number.
- Do not argue with the caller.
- Be sympathetic to the person's situation; tell them you are sorry for any inconvenience.
- Listen.
- Ask questions such as:
 - What type of odor do you smell?
 - What time did you first begin smelling the odor?
 - What was the duration of the odor?
 - Has the same odor been noticed before?
 - just in the morning, afternoon, in the evening?
 - What direction is the odor coming from?
 - Was/Is the weather unusual in any way when you smelled the odor?
- Tell the caller of any current system construction that may be contributing.
- Tell the caller what your course of action is to respond to his/her call.
- Ask if the caller would like a return call as a follow-up.

ATTACHMENT 2 - SITE MAP AND ODOR SAMPLING POINTS

ATTACHMENT 3 -FIELD ODOR SURVEY FORM

FIELD ODOR SURVEY FORM

FACILITY NAME:	DATE:
FACILITY ADDRESS:	TIME:
SURVEYOR:	

Please provide answers to the following questions.

1) Describe odors detected from other nearby sources or activities.

Weather Conditions at Time of Survey

Wind Direction and Speed:	Humidity:	Temperature:
Barometric Pressure:	Rain:	

Odor Survey Points

Point No.	Time	ODOR INTENSITY S = Strong M = Medium SL = Slight N = None	Type of ODOR	COMMENTS
1				ENTRANCE
2				ADNER MARKET
3				JUNCTION OF 607 & 610
4				SALAM CHURCH
5				BLAND HILLS LN
6				LEES NECK FARM RD.
7				CORNER OF CELL #10
8				CORNER OF CELL #13
9				CORNER OF CELL #4
10				CORNER OF CELL #3



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